



**Workshop on  
Implementing the United Nations Framework  
Classification for Resources (UNFC) in Southeast  
Europe**

# **Classroom Exercises**

**Belgrade, Republic of Serbia  
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# Mining Project



# Exercise 1: Lithium Extraction Project

- Consider a lithium mining project in Italy, with a plan to extract lithium from high-quality Spodumene deposits.
- The Practitioner has collected the relevant information for the UNFC classification tied to this project, based on the UNFC Controlling Factors and assigned them to the E, F, and G axes.

**SCAN TO ANSWER  
THE QUESTIONS**



# Exercise 1: Lithium Extraction Project



**E axis:** The project was in ownership of an exploration permit, during which a Pre-Feasibility study, evaluation of the resource/reserve, environmental impact assessment, and operational plan were conducted. The project is currently preparing to apply for an extraction permit. Current plans and assessments suggest that the project's development could proceed forward in the foreseeable future. With regards to the economic aspect, the submitted business plan includes information on production sharing, royalties, taxation, market demand, and production costs. From an environmental standpoint, the project has issued a positive environmental impact assessment, compliant with the Italian regulation. Additionally, the project is initiating an application for mining wastes permits to be submitted for public enquiry. Land use planning is also under process. Given that the area is remote and historically centered on mining activities, social contingencies and opposition seem unlikely.

**Q1: What is the correct UNFC category for the E axis?**

- A. E1
- B. E2
- C. E3

Category	Definition	Supporting explanation for minerals
E1	<i>Development and operation are confirmed to be environmentally-socially- economically viable.</i>	<i>Development and operation (prospecting, exploration, mine production, processing, sales-access to market, rehabilitation) are environmentally-socially-economically viable on the basis of current conditions and realistic assumptions of future conditions. All necessary conditions have been met (including relevant permitting and contracts) or there are reasonable expectations that all necessary conditions will be met within a reasonable timeframe and there are no impediments to the delivery of the product to the user or market. Environmental-socio-economic viability is not affected by short-term adverse conditions provided that longer-term forecasts remain positive.</i>
E2	<i>Development and operation are expected to become environmentally-socially-economically viable in the foreseeable future.</i>	<i>Development and operation (prospection, exploration, mine production, processing, sales-access to market, rehabilitation) are not yet confirmed to be environmentally-socially-economically viable but, on the basis of realistic assumptions of future conditions, there are reasonable prospects for environmental-socio-economic viability in the foreseeable future.</i>
E3	<i>Development and operation are not expected to become environmentally-socially-economically viable in the foreseeable future or evaluation is at too early a stage to determine environmental-socio-economic viability.</i>	<i>On the basis of realistic assumptions of future conditions, it is currently considered that there are not reasonable prospects for environmental-socio-economic viability of mining in the foreseeable future; or, environmental-socio-economic viability cannot yet be determined due to insufficient information (e.g. during prospecting and exploration). Also included are estimates associated with projects that are forecast to be developed, but which will be unused or consumed in operations (sub-economic ore, waste).</i>

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**What is the correct UNFC category for the E axis?**

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# Exercise 1: Lithium Extraction Project



**E axis:** The project **was in ownership** of an exploration permit, during which a **Pre-Feasibility study**, evaluation of the resource/reserve, environmental impact assessment, and operational plan were conducted. The project is currently **preparing to apply** for an extraction permit. Current plans and assessments **suggest** that the project's development could proceed forward in the foreseeable future. With regards to the economic aspect, the submitted business plan includes information on production sharing, royalties, taxation, market demand, and production costs. From an environmental standpoint, the project has issued a positive environmental impact assessment, compliant with the Italian regulation. Additionally, the project is initiating an application for mining wastes permits to be submitted for public enquiry. Land use planning is also under process. Given that the area is remote and historically centered on mining activities, social contingencies and opposition seem unlikely.

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# Exercise 1: Lithium Extraction Project



**F axis:** The project has completed the Pre-Feasibility study, but the project is still in the planning phase and hasn't commenced extraction operations since the developments await the extraction permit.

Category	Definition	Supporting explanation for minerals
F1	<i>Technical feasibility of a development project has been confirmed.</i>	<i>Development or operation is currently taking place or, sufficiently detailed studies have been completed to demonstrate the technical feasibility of development and operation. A commitment to develop should have been or will be forthcoming from all parties associated with the project, including governments.</i>
F2	<i>Technical feasibility of a development project is subject to further evaluation.</i>	<i>Preliminary studies of a defined project provide sufficient evidence of the potential for the development and that further study is warranted. Further data acquisition and/or studies maybe required to confirm the feasibility of development.</i>
F3	<i>Technical feasibility of a development project cannot be evaluated due to limited data.</i>	<i>Very preliminary studies of a project indicate the need for further data acquisition or study in order to evaluate the potential feasibility or development. Additional exploration and investigation are required to confirm or to assess the technical feasibility of the project.</i>
F4	<i>No development project or mining operation has been identified.</i>	<i>Remaining quantities of product not developed by any project (not recoverable ore, at least not with available technology, too deep, groundwater issues etc.).</i>

Category	Sub-Category	Sub-Category Definition
F1	F1.1	<i>Production or operation is currently taking place.</i>
	F1.2	<i>Capital funds have been committed and implementation of the development is underway.</i>
	F1.3	<i>Studies have been completed to demonstrate the technical feasibility of development and operation. There shall be a reasonable expectation that all necessary approvals/contracts for the project to proceed to development will be forthcoming</i>
F2	F2.1	<i>Project activities are ongoing to justify development in the foreseeable future.</i>
	F2.2	<i>Project activities are on hold and/or where justification as a development may be subject to significant delay.</i>
	F2.3	<i>There are no plans to develop or to acquire additional data at the current time due to limited potential.</i>
F3	F3.1	<i>Site-specific studies have identified a potential development with sufficient confidence to warrant further testing.</i>
	F3.2	<i>Local studies indicate the potential for development in a specific area but requires more data acquisition and/or evaluation in order to have sufficient confidence to warrant further testing.</i>
	F3.3	<i>At the earliest stage of studies, where favourable conditions for the potential development in an area may be inferred from regional studies.</i>

**Q2: What is the correct UNFC category for the F axis?**

- A. F1.1    B. F2.1    C. F2.2    D. F3.1



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**What is the correct UNFC category for the F axis?**

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# Exercise 1: Lithium Extraction Project



**F axis:** The project has completed the **Pre-Feasibility study**, but the project is **still in the planning phase** and **hasn't commenced extraction operations** since the developments await the extraction permit.

Category	Definition	Supporting explanation for minerals
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	F1.3	Studies have been completed to demonstrate the technical feasibility of development and operation. There shall be a reasonable expectation that all necessary approvals/contracts for the project to proceed to development will be forthcoming
F2	F2.1	Project activities are ongoing to justify development in the foreseeable future.
	F2.2	Project activities are on hold and/or where justification as a development may be subject to significant delay.
	F2.3	There are no plans to develop or to acquire additional data at the current time due to limited potential.
F3	F3.1	Site-specific studies have identified a potential development with sufficient confidence to warrant further testing.
	F3.2	Local studies indicate the potential for development in a specific area but requires more data acquisition and/or evaluation in order to have sufficient confidence to warrant further testing.
	F3.3	At the earliest stage of studies, where favourable conditions for the potential development in an area may be inferred from regional studies.

**Q2: What is the correct UNFC category for the F axis?**

- A. F1.1    B. F2.1    **C. F2.2**    D. F3.1

# Exercise 1: Lithium Extraction Project



**G axis:** The lithium reserves have undergone a detailed exploration campaign, and are well documented, with sufficient investigation measures and carried studies, including geochemical and geophysical analyses, to estimate the lithium quantities and quality (volumes and grades). There's also substantial geological knowledge about the area. The project has conducted a Pre-Feasibility Study, that includes reserves estimates signed off by a Competent Person. The reserve estimates are probable as per the PERC standards. The project is certain, with moderate degree of confidence, that the foreseen amount of produced lithium will be met.

**Q3: What is the correct UNFC category for the G axis?**

- A. G1
- B. G2
- C. G3

## G-Axis Categories Definitions (UNFC 2019 and UNFC Minerals Specifications)

Category	Definition
G1	Product quantity associated with a project that can be estimated with a high level of confidence
G2	Product quantity associated with a project that can be estimated with a moderate level of confidence
G3	Product quantity associated with a project that can be estimated with a low level of confidence

CRIRSCO Template			Corresponding UNFC Category <sup>f</sup>			UNFC Class
Public Report and Study Types <sup>a</sup>	Standard Definitions					
Feasibility Study or Life of Mine Plan <sup>b</sup> (for an operating mine)	Mineral Reserves	Proved	E1	F1	G1	Viable Projects
		Probable			G2	
Pre-feasibility Study <sup>d</sup>	Mineral Reserves	Proved	E2	F2	G1	Potentially Viable Projects
		Probable			G2	
Feasibility Study, Life of Mine Plan <sup>b</sup> (for an operating mine) or Pre-feasibility Study <sup>e</sup>	Mineral Resources (exclusive of Mineral Reserves)	Measured	E2	F2	G1	
		Indicated			G2	
		Inferred			G3	
Scoping Study report or other Public Report on a Mineral Resource estimate <sup>f</sup>	Mineral Resources	Measured	E2	F2	G1	
		Indicated			G2	
		Inferred			G3	
Public Report on exploration stage projects	Exploration Target		E3	F3	G4	Prospective Projects
	Exploration Results		Estimates not published			
Not applicable <sup>g</sup>	Estimates obtained from historical reports <sup>h</sup>				Non-viable Projects	

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**What is the correct UNFC category for the G axis?**

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# Exercise 1: Lithium Extraction Project



**G axis:** The lithium reserves have undergone a detailed exploration campaign, and are **well documented**, with sufficient investigation measures and carried studies, including geochemical and geophysical analyses, to estimate the lithium quantities and quality (volumes and grades). There's also substantial geological knowledge about the area. The project has conducted a **Pre-Feasibility Study**, that includes reserves estimates signed off by a Competent Person. The **reserve estimates are probable** as per the PERC standards. The project is certain, with **moderate degree of confidence**, that the foreseen amount of produced lithium will be met.

**Q3: What is the correct UNFC category for the G axis?**

- A. G1
- B. G2**
- C. G3

## G-Axis Categories Definitions (UNFC 2019 and UNFC Minerals Specifications)

Category	Definition
G1	Product quantity associated with a project that can be estimated with a high level of confidence
G2	<b>Product quantity associated with a project that can be estimated with a moderate level of confidence</b>
G3	Product quantity associated with a project that can be estimated with a low level of confidence

CRIRSCO Template			Corresponding UNFC Category <sup>f</sup>			UNFC Class
Public Report and Study Types <sup>a</sup>	Standard Definitions					
Feasibility Study or Life of Mine Plan <sup>b</sup> (for an operating mine)	Mineral Reserves	Proved	E1	F1	G1	Viable Projects
		Probable			G2	
Pre-feasibility Study <sup>d</sup>	Mineral Reserves	Proved	E2	F2	G1	Potentially Viable Projects
		Probable			G2	
Feasibility Study, Life of Mine Plan <sup>b</sup> (for an operating mine) or Pre-feasibility Study <sup>e</sup>	Mineral Resources (exclusive of Mineral Reserves)	Measured	E2	F2	G1	Potentially Viable Projects
		Indicated			G2	
		Inferred			G3	
Scoping Study report or other Public Report on a Mineral Resource estimate <sup>f</sup>	Mineral Resources	Measured	E2	F2	G1	Potentially Viable Projects
		Indicated			G2	
		Inferred			G3	
Public Report on exploration stage projects	Exploration Target	E3	F3	G4	Prospective Projects	
	Exploration Results	Estimates not published				
Not applicable <sup>g</sup>	Estimates obtained from historical reports <sup>h</sup>			Non-viable Projects		



# Exercise 1: Lithium Extraction Project



**Q4: What is the correct UNFC classification for this lithium mining project?**

- A. E1.1;F1.2;G1 (Viable, Approved for Development)
- B. E2;F2.2;G2 (Potentially Viable, Development on Hold)
- C. E3.2;F2.2;G2 (Non-Viable, Development Unclarified)

UNFC Classes Defined by Categories and Sub-categories						
Total Products	Produced	Sold or used production				
		Production which is unused or consumed in operations				
	Class	Sub-Class	Categories			
Known Sources	Viable Projects	On Production	1	1.1	1, 2, (3) <sup>e</sup>	
		Approved for Development	1	1.2	1, 2, (3) <sup>e</sup>	
		Justified for Development	1	1.3	1, 2, (3) <sup>e</sup>	
	Potentially Viable Projects	Development Pending	2 <sup>b</sup>	2.1	1, 2, 3	
		Development on Hold	2	2.2	1, 2, 3	
	Non-Viable Projects	Development Unclarified	3.2	2.2	1, 2, 3	
		Development not Viable	3.3	2.3	1, 2, 3	
	Remaining products not developed from identified projects		3.3	4	1, 2, 3	
	Potential Sources	Prospective Projects	[No Sub-classes defined]	3.2	3	4
		Remaining products not developed from prospective projects		3.3	4	4

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**What is the correct UNFC classification for this lithium mining project?**

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# Exercise 1: Lithium Extraction Project



**Q4: What is the correct UNFC classification for this lithium mining project?**

- A. E1.1;F1.2;G1 (Viable, Approved for Development)
- B. **E2;F2.2;G2 (Potentially Viable, Development on Hold)**
- C. E3.2;F2.2;G2 (Non-Viable, Development Unclarified)

UNFC Classes Defined by Categories and Sub-categories						
	Produced	Sold or used production				
		Production which is unused or consumed in operations				
	Class	Sub-Class	Categories			
			E	F	G	
Total Products	Known Sources	Viable Projects	On Production	1	1.1	1, 2, (3) <sup>e</sup>
			Approved for Development	1	1.2	1, 2, (3) <sup>e</sup>
			Justified for Development	1	1.3	1, 2, (3) <sup>e</sup>
			Potentially Viable Projects	2 <sup>b</sup>	2.1	1, 2, 3
			Development on Hold	2	2.2	1, 2, 3
			Non-Viable Projects	Development Unclarified	3.2	2.2
			Development not Viable	3.3	2.3	1, 2, 3
		Remaining products not developed from identified projects		3.3	4	1, 2, 3
	Potential Sources	Prospective Projects	[No Sub-classes defined]	3.2	3	4
		Remaining products not developed from prospective projects		3.3	4	4

# Recycling Project



# Exercise 2: Permanent Magnet Recycling



**E axis:** The project is the result of several R&D projects in the field of permanent magnet recycling and had public subventions from regional entities, the company bought last year a land where they built the new recycling plant in a region with an interest to invest in circular economy. They are waiting to sign a partnership with a big company from E-waste collection sector. In this moment the project is working with an environmental consultancy company on the environmental impact assessment in order to present the project to environmental/industrial authorities. The previous work has been done in the R&D plant that the company already have elsewhere.

Category	Definition	Supporting explanation for minerals
E1	<i>Development and operation are confirmed to be environmentally-socially-economically viable.</i>	<i>Development and operation (prospecting, exploration, mine production, processing, sales-access to market, rehabilitation) are environmentally-socially-economically viable on the basis of current conditions and realistic assumptions of future conditions. All necessary conditions have been met (including relevant permitting and contracts) or there are reasonable expectations that all necessary conditions will be met within a reasonable timeframe and there are no impediments to the delivery of the product to the user or market. Environmental-socio-economic viability is not affected by short-term adverse conditions provided that longer-term forecasts remain positive.</i>
E2	<i>Development and operation are expected to become environmentally-socially-economically viable in the foreseeable future.</i>	<i>Development and operation (prospection, exploration, mine production, processing, sales-access to market, rehabilitation) are not yet confirmed to be environmentally-socially-economically viable but, on the basis of realistic assumptions of future conditions, there are reasonable prospects for environmental-socio-economic viability in the foreseeable future.</i>
E3	<i>Development and operation are not expected to become environmentally-socially-economically viable in the foreseeable future or evaluation is at too early a stage to determine environmental-socio-economic viability.</i>	<i>On the basis of realistic assumptions of future conditions, it is currently considered that there are not reasonable prospects for environmental-socio-economic viability of mining in the foreseeable future; or, environmental-socio-economic viability cannot yet be determined due to insufficient information (e.g. during prospecting and exploration). Also included are estimates associated with projects that are forecast to be developed, but which will be unused or consumed in operations (sub-economic ore, waste).</i>

Category	Sub-Category	Sub-Category Definition
E1	E1.1	<i>Development and operation is environmentally-socially-economically viable on the basis of current conditions and realistic assumptions of future conditions.</i>
	E1.2	<i>Development and operation is not environmentally-socially-economically viable on the basis of current conditions and realistic assumptions of future conditions, but is made viable through government subsidies and/or other considerations.</i>
E2	No Sub-categories defined	
E3	E3.1	<i>Estimate of mineral product that is forecast to be developed, but which will be unused or consumed in operations.</i>
	E3.2	<i>Environmental-socio-economic viability cannot yet be determined due to insufficient information.</i>
	E3.3	<i>On the basis of realistic assumptions of future conditions, it is currently considered that there are not reasonable prospects for environmental-socio-economic viability in the foreseeable future.</i>

**Q1: What is the correct UNFC category for the E axis?**

- A. E1.1
- B. E1.2
- C. E2
- D. E3.1



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# Exercise 2: Permanent Magnet Recycling



**E axis:** The project is the result of several R&D projects in the field of permanent magnet recycling and **had public subventions** from regional entities, the company **bought last year a land where they built the new recycling plant in a region with an interest to invest in circular economy**. They are **waiting to sign a partnership** with a big company from E-waste collection sector. In this moment the project is **working** with an environmental consultancy company **on the environmental impact assessment** in order to present the project to environmental/industrial authorities. The previous work has been done in the R&D plant that the company already have elsewhere.

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**Q1: What is the correct UNFC category for the E axis?**

- A. E1.1
- B. E1.2
- C. E2
- D. E3.1

# Exercise 2: Permanent Magnet Recycling



**F axis:** The project looks to recycle permanent magnets in a close loop (magnet to magnet recycling). The process is validated in an industrial pilot scale, the company estimates their TRL of the process at 5. The upscaling of the process is under assessment by experts of the company. A first environmental benefit of the processes, compared to primary extraction of REE, has been done and demonstrates the benefits of recycling.

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**Q2: What is the correct UNFC category for the F axis?**

- A. F1.1    B. F1.2    C. F2.1    D. F2.2

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# Exercise 2: Permanent Magnet Recycling



**F axis:** The project looks to recycle permanent magnets in a close loop (magnet to magnet recycling). The process is **validated in an industrial pilot scale, the company estimates their TRL of the process at 5**. The upscaling of the process is under assessment by experts of the company. A first environmental benefit of the processes, compared to primary extraction of REE, has been done and demonstrates the benefits of recycling.

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	F3.3	At the earliest stage of studies, where favourable conditions for the potential development in an area may be inferred from regional studies.

**Q2: What is the correct UNFC category for the F axis?**

- A. F1.1    B. F1.2    C. F2.1    D. F2.2



# Exercise 2: Permanent Magnet Recycling



**G axis:** In press releases, the company is communicating that the plant will have a capacity to treat up to 1000 t/year of magnets, doing first physical treatment and later magnet recovery. The product is re-processed magnets. The company declares the intention to work with 3 main permanent magnets waste flows: permanent magnets from e-scooters, magnets contained in vehicles, and wind turbines. For e-scooters the company knows that the dismantling of the product is easy and cost effective. The company is discussing with a E-waste collector in order to secure a certain volume of e-scooters end of life in 2 or 3 European countries but this partnership is still not fully finalized. In vehicles, the company is under discussion with vehicles scrap companies but discussions are less in advance compared to e-scooters. Finally, based on MFA, the decommissioning of wind turbines with permanent magnets is not expected to have a significant volume of magnets in the short term. The company does not consider it as a major waste for recycling until 2035

**Q3: What is the correct UNFC category for the G axis?**

- A. G2 of re-processed magnets from e-scooters, G3 from vehicles
- B. All G2
- C. G1 from e-scooters and vehicles, G2 from turbines

Category	Definition	Supporting explanation for minerals
G1	Product quantity associated with a project that can be estimated with a high level of confidence.	Product quantity estimates may be categorised discretely as G1, G2 and/or G3 (along with the appropriate E and F Categories), based on the degree of confidence in the estimates (high, moderate and low confidence, respectively) based on direct evidence. Alternatively, product quantity estimates may be categorized as a range of uncertainty as reflected by either (i) three specific deterministic scenarios (low, best and high cases) or (ii) a probabilistic analysis from which three outcomes (P90, P50 and P10) are selected. In both methodologies (the "scenario" and "probabilistic" approaches), estimates are then classified on the G Axis as G1, G1+G2 and G1+G2+G3 respectively. In all cases, the product quantity estimates are those associated with a project.
G2	Product quantity associated with a project that can be estimated with a moderate level of confidence.	The G-axis Categories are intended to reflect all significant uncertainties (e.g. source uncertainty, geologic uncertainty, facility efficiency uncertainty, etc.) impacting the estimate forecast for the project. Uncertainties include variability, intermittency and the efficiency of the development and operation (where relevant). Typically, the various uncertainties will combine to provide a full range of outcomes. In such cases, categorization should reflect three scenarios or outcomes that are equivalent to G1, G1+G2 and G1+G2+G3.
G3	Product quantity associated with a project that can be estimated with a low level of confidence.	Additional Comments: The G axis in minerals and mining conditions primarily reflect geologic uncertainty impacting the estimate forecast for the project. Uncertainties include availability and resolution of direct data such as drill hole density in relation to the mineralisation and or deposit type.  In addition, indirect data such as geophysical data might be included, which should be measured against redundancy of methods (e.g. geophysical measurements calibrated against drill core evaluation, drill hole logs. Calibrated methods provide higher certainty than uncalibrated methods.)  The accuracy of measurements controls the level of the category (lab assay, rock mechanics, mineralogical phase assessment).

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**What is the correct UNFC category for the G axis?**

**i** Start presenting to display the poll results on this slide.

# Exercise 2: Permanent Magnet Recycling



**G axis:** In press releases, the company is communicating that the plant will have a capacity to treat up to 1000 t/year of magnets, doing first physical treatment and later magnet recovery. The product is re-processed magnets. The company declares the intention to work with 3 main permanent magnets waste flows: permanent magnets from e-scooters, magnets contained in vehicles, and wind turbines. For e-scooters the company knows that the dismantling of the product is easy and cost effective. **The company is discussing with a E-waste collector in order to secure a certain volume of e-scooters end of life in 2 or 3 European countries but this partnership is still not fully finalized. In vehicles, the company is under discussion with vehicles scrap companies but discussions are less in advance compared to e-scooters.** Finally, based on MFA, the decommissioning of wind turbines with permanent magnets is **not expected to have a significant volume of magnets in the short term.** The company does not consider it as a major waste for recycling **until 2035**

**Q3: What is the correct UNFC category for the G axis?**

- A. G2 of re-processed magnets from e-scooters, G3 from vehicles
- B. All G2
- C. G1 from e-scooters and vehicles, G2 from turbines

Category	Definition	Supporting explanation for minerals
G1	Product quantity associated with a project that can be estimated with a high level of confidence.	Product quantity estimates may be categorised discretely as G1, G2 and/or G3 (along with the appropriate E and F Categories), based on the degree of confidence in the estimates (high, moderate and low confidence, respectively) based on direct evidence. Alternatively, product quantity estimates may be categorized as a range of uncertainty as reflected by either (i) three specific deterministic scenarios (low, best and high cases) or (ii) a probabilistic analysis from which three outcomes (P90, P50 and P10) are selected. In both methodologies (the "scenario" and "probabilistic" approaches), estimates are then classified on the G Axis as G1, G1+G2 and G1+G2+G3 respectively. In all cases, the product quantity estimates are those associated with a project.
G2	Product quantity associated with a project that can be estimated with a moderate level of confidence.	The G-axis Categories are intended to reflect all significant uncertainties (e.g. source uncertainty, geologic uncertainty, facility efficiency uncertainty, etc.) impacting the estimate forecast for the project. Uncertainties include variability, intermittency and the efficiency of the development and operation (where relevant). Typically, the various uncertainties will combine to provide a full range of outcomes. In such cases, categorization should reflect three scenarios or outcomes that are equivalent to G1, G1+G2 and G1+G2+G3.
G3	Product quantity associated with a project that can be estimated with a low level of confidence.	Additional Comments: The G axis in minerals and mining conditions primarily reflect geologic uncertainty impacting the estimate forecast for the project. Uncertainties include availability and resolution of direct data such as drill hole density in relation to the mineralisation and or deposit type. In addition, indirect data such as geophysical data might be included, which should be measured against redundancy of methods (e.g. geophysical measurements calibrated against drill core evaluation, drill hole logs. Calibrated methods provide higher certainty than uncalibrated methods.)  The accuracy of measurements controls the level of the category (lab assay, rock mechanics, mineralogical phase assessment).

# Exercise 2: Permanent Magnet Recycling



**Q4: What is the correct UNFC classification for this permanent magnet recycling project?**

- A. E2;F2.1;G2+G3 (Potentially Viable, Development Pending)
- B. E1;F1.2;G1+G2 (Viable, Approved for Development)
- C. E1.1;F1.3;G1 (Viable, Justified for Development)
- D. E2;F2.2;G2+G3 (Potentially Viable, Development on Hold)

UNFC Classes Defined by Categories and Sub-categories						
Total Products	Produced	Sold or used production				
		Production which is unused or consumed in operations				
	Class	Sub-Class	Categories			
			E	F	G	
Total Products	Known Sources	Viable Projects	On Production	1	1.1	1, 2, (3) <sup>e</sup>
			Approved for Development	1	1.2	1, 2, (3) <sup>e</sup>
			Justified for Development	1	1.3	1, 2, (3) <sup>e</sup>
		Potentially Viable Projects	Development Pending	2 <sup>b</sup>	2.1	1, 2, 3
			Development on Hold	2	2.2	1, 2, 3
		Non-Viable Projects	Development Unclassified	3.2	2.2	1, 2, 3
	Development not Viable		3.3	2.3	1, 2, 3	
		Remaining products not developed from identified projects	3.3	4	1, 2, 3	
	Potential Sources	Prospective Projects	[No Sub-classes defined]	3.2	3	4
			Remaining products not developed from prospective projects	3.3	4	4

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**What is the correct UNFC classification for this permanent magnet recycling project?**

ⓘ Start presenting to display the poll results on this slide.



# Exercise 2: Permanent Magnet Recycling



**Q4: What is the correct UNFC classification for this permanent magnet recycling project?**

- A. E2;F2.1;G2+G3 (Potentially Viable, Development Pending)
- B. E1;F1.2;G1+G2 (Viable, Approved for Development)
- C. E1.1;F1.3;G1 (Viable, Justified for Development)
- D. E2;F2.2;G2+G3 (Potentially Viable, Development on Hold)

*UNFC Classes Defined by Categories and Sub-categories*

	Produced	Sold or used production					
		Production which is unused or consumed in operations					
	Class	Sub-Class	Categories				
E			F	G			
Total Products	Known Sources	Viable Projects	On Production	1	1.1	1, 2, (3) <sup>e</sup>	
			Approved for Development	1	1.2	1, 2, (3) <sup>e</sup>	
		Potentially Viable Projects	Justified for Development	1	1.3	1, 2, (3) <sup>e</sup>	
			Development Pending	2 <sup>b</sup>	2.1	1, 2, 3	
			Development on Hold	2	2.2	1, 2, 3	
			Non-Viable Projects	Development Unclassified	3.2	2.2	1, 2, 3
		Development not Viable		3.3	2.3	1, 2, 3	
		Remaining products not developed from identified projects		3.3	4	1, 2, 3	
		Potential Sources	Prospective Projects	[No Sub-classes defined]	3.2	3	4
			Remaining products not developed from prospective projects		3.3	4	4

# Processing Project



# Exercise 3: Copper Processing Project

A copper mining project is planning to expand its operations with a processing plant. The mine is currently located in a historically significant mining region in Spain. The project aims to leverage the existing mining site to process copper ore into copper concentrate, which is crucial for various industries, including electronics, construction, and renewable energy infrastructure. The copper-rich region is well-established with infrastructure to support mining and processing operations, including transportation networks and access to utilities. The foreseen processing plant will be at a 20 km distance from the mine.

**SCAN TO ANSWER  
THE QUESTIONS**



# Exercise 3: Copper Processing Project

**E axis:** An environmental impact assessment has been completed, and the project has received preliminary environmental approval. The processing facility is designed to minimize emissions and water usage, complying with Spanish environmental regulations. The project is also preparing to submit waste management plans for public consultation. The project has undergone a detailed feasibility study. However, adequate funding has not yet been secured for the project's development. The project site is in a region with a long history of mining activities, and provides jobs to most of the community. Preparations for final permits are ongoing.

Category	Definition	Supporting explanation for minerals
E1	<i>Development and operation are confirmed to be environmentally-socially-economically viable.</i>	<i>Development and operation (prospecting, exploration, mine production, processing, sales-access to market, rehabilitation) are environmentally-socially-economically viable on the basis of current conditions and realistic assumptions of future conditions. All necessary conditions have been met (including relevant permitting and contracts) or there are reasonable expectations that all necessary conditions will be met within a reasonable timeframe and there are no impediments to the delivery of the product to the user or market. Environmental-socio-economic viability is not affected by short-term adverse conditions provided that longer-term forecasts remain positive.</i>
E2	<i>Development and operation are expected to become environmentally-socially-economically viable in the foreseeable future.</i>	<i>Development and operation (prospection, exploration, mine production, processing, sales-access to market, rehabilitation) are not yet confirmed to be environmentally-socially-economically viable but, on the basis of realistic assumptions of future conditions, there are reasonable prospects for environmental-socio-economic viability in the foreseeable future.</i>
E3	<i>Development and operation are not expected to become environmentally-socially-economically viable in the foreseeable future or evaluation is at too early a stage to determine environmental-socio-economic viability.</i>	<i>On the basis of realistic assumptions of future conditions, it is currently considered that there are not reasonable prospects for environmental-socio-economic viability of mining in the foreseeable future; or, environmental-socio-economic viability cannot yet be determined due to insufficient information (e.g. during prospecting and exploration). Also included are estimates associated with projects that are forecast to be developed, but which will be unused or consumed in operations (sub-economic ore, waste).</i>

Category	Sub-Category	Sub-Category Definition
E1	E1.1	<i>Development and operation is environmentally-socially-economically viable on the basis of current conditions and realistic assumptions of future conditions.</i>
	E1.2	<i>Development and operation is not environmentally-socially-economically viable on the basis of current conditions and realistic assumptions of future conditions, but is made viable through government subsidies and/or other considerations.</i>
E2	No Sub-categories defined	
E3	E3.1	<i>Estimate of mineral product that is forecast to be developed, but which will be unused or consumed in operations.</i>
	E3.2	<i>Environmental-socio-economic viability cannot yet be determined due to insufficient information.</i>
	E3.3	<i>On the basis of realistic assumptions of future conditions, it is currently considered that there are not reasonable prospects for environmental-socio-economic viability in the foreseeable future.</i>



**Q1: What is the correct UNFC category for the E axis?**

- A. E1.1
- B. E1.2
- C. E2
- D. E3.1

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**What is the correct UNFC category for the E axis?**

ⓘ Start presenting to display the poll results on this slide.



# Exercise 3: Copper Processing Project

**E axis:** An environmental impact assessment has been completed, and the project has received preliminary environmental approval. The processing facility is designed to minimize emissions and water usage, complying with Spanish environmental regulations. The project is also preparing to submit waste management plans for public consultation. The project has undergone a **detailed feasibility study**. However, **adequate funding has not yet been secured** for the project's development. The project site is in a region with a long history of mining activities, and provides jobs to most of the community. **Preparations for final permits are ongoing.**

Category	Definition	Supporting explanation for minerals
E1	<i>Development and operation are confirmed to be environmentally-socially-economically viable.</i>	<i>Development and operation (prospecting, exploration, mine production, processing, sales-access to market, rehabilitation) are environmentally-socially-economically viable on the basis of current conditions and realistic assumptions of future conditions. All necessary conditions have been met (including relevant permitting and contracts) or there are reasonable expectations that all necessary conditions will be met within a reasonable timeframe and there are no impediments to the delivery of the product to the user or market. Environmental-socio-economic viability is not affected by short-term adverse conditions provided that longer-term forecasts remain positive.</i>
E2	<i>Development and operation are expected to become environmentally-socially-economically viable in the foreseeable future.</i>	<i>Development and operation (prospection, exploration, mine production, processing, sales-access to market, rehabilitation) are not yet confirmed to be environmentally-socially-economically viable but, on the basis of realistic assumptions of future conditions, there are reasonable prospects for environmental-socio-economic viability in the foreseeable future.</i>
E3	<i>Development and operation are not expected to become environmentally-socially-economically viable in the foreseeable future or evaluation is at too early a stage to determine environmental-socio-economic viability.</i>	<i>On the basis of realistic assumptions of future conditions, it is currently considered that there are not reasonable prospects for environmental-socio-economic viability of mining in the foreseeable future; or, environmental-socio-economic viability cannot yet be determined due to insufficient information (e.g. during prospecting and exploration). Also included are estimates associated with projects that are forecast to be developed, but which will be unused or consumed in operations (sub-economic ore, waste).</i>

Category	Sub-Category	Sub-Category Definition
E1	E1.1	<i>Development and operation is environmentally-socially-economically viable on the basis of current conditions and realistic assumptions of future conditions.</i>
	E1.2	<i>Development and operation is not environmentally-socially-economically viable on the basis of current conditions and realistic assumptions of future conditions, but is made viable through government subsidies and/or other considerations.</i>
E2	No Sub-categories defined	
E3	E3.1	<i>Estimate of mineral product that is forecast to be developed, but which will be unused or consumed in operations.</i>
	E3.2	<i>Environmental-socio-economic viability cannot yet be determined due to insufficient information.</i>
	E3.3	<i>On the basis of realistic assumptions of future conditions, it is currently considered that there are not reasonable prospects for environmental-socio-economic viability in the foreseeable future.</i>



**Q1: What is the correct UNFC category for the E axis?**

- A. E1.1
- B. E1.2
- C. E2
- D. E3.1

# Exercise 3: Copper Processing Project



**F axis:** The project has completed its feasibility study, which includes detailed engineering designs and technological assessments. The processing technology to be used is proven and reliable, ensuring efficient conversion of copper ore to copper concentrate. Although the feasibility study is complete, the project is in need to secure adequate investments before commencement of construction.

Category	Definition	Supporting explanation for minerals
F1	Technical feasibility of a development project has been confirmed.	Development or operation is currently taking place or, sufficiently detailed studies have been completed to demonstrate the technical feasibility of development and operation. A commitment to develop should have been or will be forthcoming from all parties associated with the project, including governments.
F2	Technical feasibility of a development project is subject to further evaluation.	Preliminary studies of a defined project provide sufficient evidence of the potential for the development and that further study is warranted. Further data acquisition and/or studies may be required to confirm the feasibility of development.
F3	Technical feasibility of a development project cannot be evaluated due to limited data.	Very preliminary studies of a project indicate the need for further data acquisition or study in order to evaluate the potential feasibility or development. Additional exploration and investigation are required to confirm or to assess the technical feasibility of the project.
F4	No development project or mining operation has been identified.	Remaining quantities of product not developed by any project (not recoverable ore, at least not with available technology, too deep, groundwater issues etc.).

Category	Sub-Category	Sub-Category Definition
F1	F1.1	Production or operation is currently taking place.
	F1.2	Capital funds have been committed and implementation of the development is underway.
	F1.3	Studies have been completed to demonstrate the technical feasibility of development and operation. There shall be a reasonable expectation that all necessary approvals/contracts for the project to proceed to development will be forthcoming
F2	F2.1	Project activities are ongoing to justify development in the foreseeable future.
	F2.2	Project activities are on hold and/or where justification as a development may be subject to significant delay.
	F2.3	There are no plans to develop or to acquire additional data at the current time due to limited potential.
F3	F3.1	Site-specific studies have identified a potential development with sufficient confidence to warrant further testing.
	F3.2	Local studies indicate the potential for development in a specific area but requires more data acquisition and/or evaluation in order to have sufficient confidence to warrant further testing.
	F3.3	At the earliest stage of studies, where favourable conditions for the potential development in an area may be inferred from regional studies.

**Q2:** What is the correct UNFC category for the F axis?

- A. F1.1    B. F1.2    C. F1.3    D. F2.1

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**What is the correct UNFC category for the F axis?**

**i** Start presenting to display the poll results on this slide.

# Exercise 3: Copper Processing Project



**F axis:** The project has completed its **feasibility study**, which includes detailed engineering designs and technological assessments. The processing technology to be used is **proven and reliable**, ensuring efficient conversion of copper ore to copper concentrate. Although the feasibility study is complete, the project is in need **to secure adequate investments before commencement of construction**.

Category	Definition	Supporting explanation for minerals
F1	Technical feasibility of a development project has been confirmed.	Development or operation is currently taking place or, sufficiently detailed studies have been completed to demonstrate the technical feasibility of development and operation. A commitment to develop should have been or will be forthcoming from all parties associated with the project, including governments.
F2	Technical feasibility of a development project is subject to further evaluation.	Preliminary studies of a defined project provide sufficient evidence of the potential for the development and that further study is warranted. Further data acquisition and/or studies may be required to confirm the feasibility of development.
F3	Technical feasibility of a development project cannot be evaluated due to limited data.	Very preliminary studies of a project indicate the need for further data acquisition or study in order to evaluate the potential feasibility or development. Additional exploration and investigation are required to confirm or to assess the technical feasibility of the project.
F4	No development project or mining operation has been identified.	Remaining quantities of product not developed by any project (not recoverable ore, at least not with available technology, too deep, groundwater issues etc.).

Category	Sub-Category	Sub-Category Definition
F1	F1.1	Production or operation is currently taking place.
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	F1.3	Studies have been completed to demonstrate the technical feasibility of development and operation. There shall be a reasonable expectation that all necessary approvals/contracts for the project to proceed to development will be forthcoming
F2	F2.1	Project activities are ongoing to justify development in the foreseeable future.
	F2.2	Project activities are on hold and/or where justification as a development may be subject to significant delay.
	F2.3	There are no plans to develop or to acquire additional data at the current time due to limited potential.
F3	F3.1	Site-specific studies have identified a potential development with sufficient confidence to warrant further testing.
	F3.2	Local studies indicate the potential for development in a specific area but requires more data acquisition and/or evaluation in order to have sufficient confidence to warrant further testing.
	F3.3	At the earliest stage of studies, where favourable conditions for the potential development in an area may be inferred from regional studies.

**Q2: What is the correct UNFC category for the F axis?**

- A. F1.1    B. F1.2    C. F1.3    D. F2.1



# Exercise 3: Copper Processing Project



**G axis:** The copper ore at the existing mining site has been well-documented through extensive exploration and drilling campaigns. Detailed geological surveys and sampling have provided a high degree of confidence in the quantity and quality of the ore, meaning that the ore reserves are confirmed and the processing facility is assured of a consistent supply of raw material.

**Q3: What is the correct UNFC category for the G axis?**

- A. G1
- B. G2
- C. G3

Category	Definition	Supporting explanation for minerals
G1	Product quantity associated with a project that can be estimated with a high level of confidence.	Product quantity estimates may be categorised discretely as G1, G2 and/or G3 (along with the appropriate E and F Categories), based on the degree of confidence in the estimates (high, moderate and low confidence, respectively) based on direct evidence. Alternatively, product quantity estimates may be categorized as a range of uncertainty as reflected by either (i) three specific deterministic scenarios (low, best and high cases) or (ii) a probabilistic analysis from which three outcomes (P90, P50 and P10) are selected. In both methodologies (the "scenario" and "probabilistic" approaches), estimates are then classified on the G Axis as G1, G1+G2 and G1+G2+G3 respectively. In all cases, the product quantity estimates are those associated with a project.
G2	Product quantity associated with a project that can be estimated with a moderate level of confidence.	The G-axis Categories are intended to reflect all significant uncertainties (e.g. source uncertainty, geologic uncertainty, facility efficiency uncertainty, etc.) impacting the estimate forecast for the project. Uncertainties include variability, intermittency and the efficiency of the development and operation (where relevant). Typically, the various uncertainties will combine to provide a full range of outcomes. In such cases, categorization should reflect three scenarios or outcomes that are equivalent to G1, G1+G2 and G1+G2+G3.
G3	Product quantity associated with a project that can be estimated with a low level of confidence.	<p>Additional Comments:</p> <p>The G axis in minerals and mining conditions primarily reflect geologic uncertainty impacting the estimate forecast for the project. Uncertainties include availability and resolution of direct data such as drill hole density in relation to the mineralisation and or deposit type.</p> <p>In addition, indirect data such as geophysical data might be included, which should be measured against redundancy of methods (e.g. geophysical measurements calibrated against drill core evaluation, drill hole logs. Calibrated methods provide higher certainty than uncalibrated methods.)</p> <p>The accuracy of measurements controls the level of the category (lab assay, rock mechanics, mineralogical phase assessment).</p>



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**What is the correct UNFC category for the G axis?**

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# Exercise 3: Copper Processing Project



**G axis:** The copper ore at the existing mining site has been well-documented through extensive exploration and drilling campaigns. Detailed geological surveys and sampling have provided a **high degree of confidence** in the quantity and quality of the ore, meaning that the ore reserves are confirmed and **the processing facility is assured of a consistent supply of raw material.**

**Q3: What is the correct UNFC category for the G axis?**

- A. G1
- B. G2
- C. G3

Category	Definition	Supporting explanation for minerals
G1	Product quantity associated with a project that can be estimated with a high level of confidence.	Product quantity estimates may be categorised discretely as G1, G2 and/or G3 (along with the appropriate E and F Categories), based on the degree of confidence in the estimates (high, moderate and low confidence, respectively) based on direct evidence. Alternatively, product quantity estimates may be categorized as a range of uncertainty as reflected by either (i) three specific deterministic scenarios (low, best and high cases) or (ii) a probabilistic analysis from which three outcomes (P90, P50 and P10) are selected. In both methodologies (the "scenario" and "probabilistic" approaches), estimates are then classified on the G Axis as G1, G1+G2 and G1+G2+G3 respectively. In all cases, the product quantity estimates are those associated with a project.
G2	Product quantity associated with a project that can be estimated with a moderate level of confidence.	The G-axis Categories are intended to reflect all significant uncertainties (e.g. source uncertainty, geologic uncertainty, facility efficiency uncertainty, etc.) impacting the estimate forecast for the project. Uncertainties include variability, intermittency and the efficiency of the development and operation (where relevant). Typically, the various uncertainties will combine to provide a full range of outcomes. In such cases, categorization should reflect three scenarios or outcomes that are equivalent to G1, G1+G2 and G1+G2+G3.
G3	Product quantity associated with a project that can be estimated with a low level of confidence.	<p>Additional Comments:</p> <p>The G axis in minerals and mining conditions primarily reflect geologic uncertainty impacting the estimate forecast for the project. Uncertainties include availability and resolution of direct data such as drill hole density in relation to the mineralisation and or deposit type.</p> <p>In addition, indirect data such as geophysical data might be included, which should be measured against redundancy of methods (e.g. geophysical measurements calibrated against drill core evaluation, drill hole logs. Calibrated methods provide higher certainty than uncalibrated methods.)</p> <p>The accuracy of measurements controls the level of the category (lab assay, rock mechanics, mineralogical phase assessment).</p>

# Exercise 3: Copper Processing Project



**Q4: What is the correct UNFC classification for this copper processing project?**

- A. E1.1;F1.1;G1 (Viable, On Production)
- B. E1.1;F1.2;G1 (Viable, Approved for Development)
- C. E1.1;F1.3;G1 (Viable, Justified for Development)
- D. E2;F2.1;G2 (Potentially Viable, Development Pending)

UNFC Classes Defined by Categories and Sub-categories						
	Produced	Sold or used production				
		Production which is unused or consumed in operations				
	Class	Sub-Class	Categories			
			E	F	G	
Total Products	Known Sources	Viable Projects	On Production	1	1.1	1, 2, (3) <sup>e</sup>
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			Justified for Development	1	1.3	1, 2, (3) <sup>e</sup>
		Potentially Viable Projects	Development Pending	2 <sup>b</sup>	2.1	1, 2, 3
			Development on Hold	2	2.2	1, 2, 3
		Non-Viable Projects	Development Unclassified	3.2	2.2	1, 2, 3
	Development not Viable		3.3	2.3	1, 2, 3	
	Remaining products not developed from identified projects			3.3	4	1, 2, 3
	Potential Sources	Prospective Projects	[No Sub-classes defined]	3.2	3	4
		Remaining products not developed from prospective projects		3.3	4	4

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**What is the correct UNFC classification for this copper processing project?**

ⓘ Start presenting to display the poll results on this slide.

# Exercise 3: Copper Processing Project



**Q4: What is the correct UNFC classification for this copper processing project?**

- A. E1.1;F1.1;G1 (Viable, On Production)
- B. E1.1;F1.2;G1 (Viable, Approved for Development)
- C. E1.1;F1.3;G1 (Viable, Justified for Development)**
- D. E2;F2.1;G2 (Potentially Viable, Development Pending)

UNFC Classes Defined by Categories and Sub-categories						
Produced	Sold or used production					
	Production which is unused or consumed in operations					
Class	Sub-Class	Categories				
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	Potentially Viable Projects	Development Pending	2 <sup>b</sup>	2.1	1, 2, 3	
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		Non-Viable Projects	Development Unclassified	3.2	2.2	1, 2, 3
			Development not Viable	3.3	2.3	1, 2, 3
	Remaining products not developed from identified projects		3.3	4	1, 2, 3	
	Potential Sources	Prospective Projects	[No Sub-classes defined]	3.2	3	4
		Remaining products not developed from prospective projects		3.3	4	4





**Workshop on  
Implementing the United Nations Framework  
Classification for Resources (UNFC) in Southeast  
Europe**

**Thank you!**

**THE VIEWS EXPRESSED ARE  
THOSE OF THE AUTHOR AND  
DO NOT NECESSARILY  
REFLECT THE VIEWS OF THE  
UNITED NATIONS**

**Belgrade, Republic of Serbia  
4 – 5 July 2024**

**Ghadi Sabra  
PhD Candidate  
Politecnico di Torino**

