



# GSEU

GEOLOGICAL SERVICE | FOR EUROPE

## GSEU WP2 TRAIN-THE-TRAINER COURSE

### Module: Historical Data Principles

#### Level 1

Ljubljana , April 15<sup>th</sup> and 16<sup>th</sup> 2024

Tuomas Leskelä, GTK

Lena Lundqvist, SGU

Antje Wittenberg, BGR

[www.geologicalservice.eu](http://www.geologicalservice.eu)



Funded by  
the European Union





10h05 – 11h05

## Historical Data principles

- Challenges of historical data sets
- UNFC classes used with historic estimates
- Underpinning plenary case exercise

**Tuomas Leskela, GTK;**  
Janne Hokka, GTK; Antje Wittenberg, BGR





# Historic estimates

## Training Level 1

What are historic estimates?

What are the main principles in dealing with historic estimates and UNFC?

What are the UNFC main classes and sub-classes to be used with historic estimates?

UNFC mapping for a historic project with little background information

## Training Level 2

- UNFC mapping for cases of:
  - Historic estimate with extensive background information
  - Closed mines
  - Project ownership change
  - Commodities dropped from company estimates
- Monitoring projects in the context of UNFC



## Main principles

- The reason for mapping historic estimates into UNFC is for **European resource management** of national inventories
- UNFC mapping reflects the **maturity of the project** and any estimation of future conditions on the part of the evaluator should not be included in the mapping methodology
- The role of the evaluator (e.g. individual at a geological survey) should be minimized:
  - All mapping should be **transparent, consistent and coherent**
  - No effect on the results based on who is doing the evaluating
  - Reported quantities cannot be modified from the original source
- **Relevant bridging documents** should be used



## Historic estimates

- Includes:
  - Estimates for projects that are **non-active**, e.g. abandoned projects, closed mines
  - Active projects where there has been an **ownership change**, and the new owner has not confirmed the previous resource
    - In some CRIRSCO-aligned systems, these are considered 'historical estimates' or 'foreign estimates' which do not represent mineral resources
  - **'Old' estimates** with variable amounts of information that are not compliant with the current classification systems and bridging documents cannot be directly used
- Common issues with historic estimates include:
  - No sign-off by a competent or qualified person
  - No QA/QC protocols
  - Chemical assays, technical feasibility and beneficiation studies outdated due to advances in technology since the estimate
  - Permitting expired
  - Commodity prices changed
- In UNFC, these projects are mapped as non-viable projects (323), prospective projects (334) and remaining products not developed from identified projects (343) -classes



## Main principles

- Projects can be active or non-active even with regard to historic estimates
- The project classes (which reflect the maturity range of the projects) in UNFC is:
  - Viable
  - Potentially viable
  - **Non-viable**
  - **Prospective**
- Only disclosed tonnage and grade estimates can be mapped into UNFC



Relevant to historic estimates



## Historic estimates

- Historic resource quantities often possess high uncertainty with respect to
  - The environmental-socio-economic issues (E-axis),
  - Technical feasibility issues (F-axis),
  - Geological knowledge regarding quantities and qualities (G-axis)
- The estimates may be based on an Identified Project but until a commercial operator is engaged and has verified or updated the estimates of the quantities, it should be mapped under the Non-Viable or Prospective Project Class.
- Classification of Non-Viable Projects coded as historic, closed, or abandoned need to be considered case-specifically
- Non-Viable Projects are not compliant with CRIRSCO requirements, and therefore the Bridging Document cannot be used directly



## G-axis and QA/QC protocols

- Historic resource estimates, especially pre-1990s, were not subjected to the same scrutiny as modern estimates
- Proper set up of e.g. QA/QC protocols were introduced long after the work for many historic estimates had been done
- Essentially, historic estimates from the previous century should never get a G-axis value other than 3 or 4 even if extensive work went in to the resource estimate





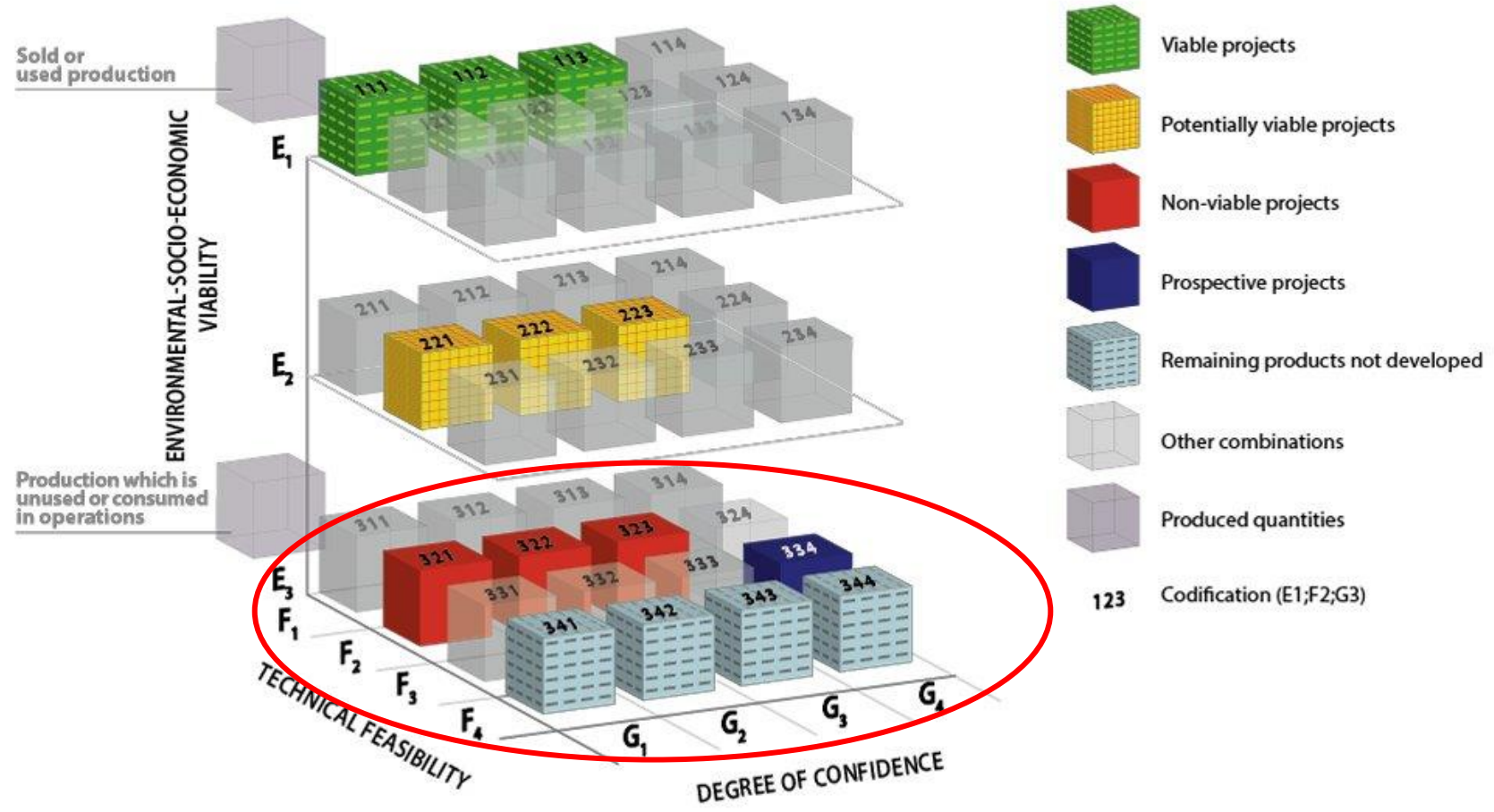
# Historic estimates

- UNFC codifications from 111 to 223 are mainly for products with direct evidence of ownership, plans for technical feasibility of development and/or planned activities related to minerals projects
- These are not, for example, for historic or abandoned projects regardless of availability of technical and geological information

UNFC Classes Defined by Categories and Sub-categories						INSPIRE Code List	
Produced	Sold or used production						
	Production which is unused or consumed in operations <i>Future production that is either unused or consumed in the Project operations is categorized as E3.1. These can exist for all Classes of recoverable quantities</i>						
Total Products	Class	Sub-class	Categories			INSPIRE Code List	
			E	F	G		
Known Sources	<b>Viable Projects</b> <i>Estimates associated with Viable Projects are defined in many classification systems as Reserves, but there are some material differences between the specific definitions that are applied within different industries and hence the term is not used here.</i>	On Production	1	1.1	1, 2, (3)	operating continuously operating intermittently	
		Approved for Development	1	1.2	1, 2, 3	under development	
		Justified for Development	1	1.3	1, 2, 3	pending approval	
	<b>Potentially Viable Projects</b> <i>Not all Potentially Viable Projects will be developed</i>	Development Pending	2	2.1	1, 2, 3	feasibility evaluation of the ore deposit	
		Development On Hold	2	2.2	1, 2, 3	care and maintenance retention	
	<b>Non-Viable Projects</b> <i>Non-Viable Projects include those that are at an early stage of evaluation in addition to those that are considered unlikely to become Viable developments within the Foreseeable Future.</i>	Development Unclassified	3.2	2.2	1, 2, 3	resource assessment (geological interpretation, approximate calculation of the resource)	
		Development Not Viable	3.3	2.3	1, 2, 3	closed abandoned historic	
		<b>Remaining Products not developed from identified Projects</b> <i>Remaining Products not developed from identified Projects or Prospective Projects may become developable in the future as technological or environmental-socio-economic conditions change. Some or all these estimates may never be developed due to physical and/or environmental-socio-economic constraints.</i>		3.3	4	1, 2, 3	
	Potential Sources	<b>Prospective Projects</b>		3.2	3.1	4	subsurface exploration
				3.2	3.2	4	detailed surface exploration
3.2				3.3	4	regional reconnaissance	
<b>Remaining Products not developed from Prospective Projects</b>		3.3	4.1	4			
		3.3	4.2	4			



# Main principles





# Main class: Non-viable: E3;F2;G1-3

## • Definition:

- Non-Viable Projects are potential future recovery by mining operations, but where **development is uncertain**, or development is currently assessed as **not Viable**.

## • Examples:

- A mine **closed** with no immediate prospects to be reopened
- A project that that has undergone **ownership change** after resource estimation but has a holder and is considered an active

UNFC Classes Defined by Categories and Sub-categories						INSPIRE Code List
Produced	Sold or used production					
	Production which is unused or consumed in operations <i>Future production that is either unused or consumed in the Project operations is categorized as E3.1. These can exist for all Classes of recoverable quantities</i>					
Total Products	Class	Sub-class	Categories			INSPIRE Code List
			E	F	G	
Known Sources	<u>Viable Projects</u> <i>Estimates associated with Viable Projects are defined in many classification systems as Reserves, but there are some material differences between the specific definitions that are applied within different industries and hence the term is not used here.</i>	On Production	1	1.1	1, 2, (3)	operating continuously operating intermittently
		Approved for Development	1	1.2	1, 2, 3	under development
		Justified for Development	1	1.3	1, 2, 3	pending approval
	<u>Potentially Viable Projects</u> <i>Not all Potentially Viable Projects will be developed</i>	Development Pending	2	2.1	1, 2, 3	feasibility evaluation of the ore deposit
		Development On Hold	2	2.2	1, 2, 3	care and maintenance retention
	<u>Non-Viable Projects</u> <i>Non-Viable Projects include those that are at an early stage of evaluation in addition to those that are considered unlikely to become Viable developments within the Foreseeable Future.</i>	Development Unclassified	3.2	2.2	1, 2, 3	resource assessment (geological interpretation, approximate calculation of the resource)
		Development Not Viable	3.3	2.3	1, 2, 3	closed abandoned historic
	<u>Remaining Products not developed from identified Projects</u> <i>Remaining Products not developed from identified Projects or Prospective Projects may become developable in the future as technological or environmental- socio- economic conditions change. Some or all these estimates may never be developed due to physical and/or environmental- socio- economic constraints.</i>		3.3	4	1, 2, 3	
	Potential Sources	<u>Prospective Projects</u>	3.2	3.1	4	subsurface exploration
			3.2	3.2	4	detailed surface exploration
3.2			3.3	4	regional reconnaissance	
3.3		4.1	4			
3.3		4.2	4			



## Sub-classes: Non-viable: 323

- **Development unclarified E3.2;F2.2;G1-3:**
  - Appropriate for Projects that are in the initial stages of technical and economic evaluation (e.g., a recent new discovery), and/or where significant further data acquisition is required, to make a meaningful assessment of the potential for an economic development (i.e., there is currently insufficient basis for concluding that there are Reasonable Prospects for eventual social, environmental, and economically Viable production).
  - Essentially used for **projects that have seen extensive work** with regard to their development and are active, but where an **ownership change** or other event has put the future of the development of the project into question.
- **Development not viable E3.3;F2.3;G1-3**
  - Used for projects that are non-active or where a technically feasible Project can be identified, but it has been assessed as having insufficient potential to warrant any further data acquisition activities or any direct efforts to progress the Project.
  - Essentially used for **closed mines**.
  - Applicable to some **abandoned projects**.

<u>Non-Viable Projects</u>					
<i>Non-Viable Projects include those that are at an early stage of evaluation in addition to those that are considered unlikely to become Viable developments within the Foreseeable Future.<sup>c</sup></i>	Development Unclarified	3.2	2.2	1, 2, 3	resource assessment (geological interpretation, approximate calculation of the resource)
	Development Not Viable	3.3	2.3	1, 2, 3	closed abandoned historic



# Main class: Prospective: 334

- **Definition:**
  - Prospective Projects are a **potential future recovery by successful exploration activities**. A Prospective Project is associated with one or more major occurrences with only little direct evidence (e.g., drilling and/or sampling), or primarily indirect evidence (e.g., surface, or airborne geophysical measurements)
- **Examples:**
  - **Prospective Projects** that never had standard-based resource assessments made and have never been mined
  - Deposits reported as “**exploration targets**” under CRIRSCO-style reporting standards/codes
  - Preliminary resource estimations made by e.g. **GSOs**
  - Applicable to some **abandoned** projects

UNFC Classes Defined by Categories and Sub-categories						INSPIRE Code List
Produced	Sold or used production					
	Production which is unused or consumed in operations <i>Future production that is either unused or consumed in the Project operations is categorized as E3.1. These can exist for all Classes of recoverable quantities</i>					
Total Products	Class	Sub-class	Categories			
			E	F	G	
Known Sources	<b>Viable Projects</b> <i>Estimates associated with Viable Projects are defined in many classification systems as Reserves, but there are some material differences between the specific definitions that are applied within different industries and hence the term is not used here.</i>	On Production	1	1.1	1, 2, (3)	operating continuously operating intermittently
		Approved for Development	1	1.2	1, 2, 3	under development
		Justified for Development	1	1.3	1, 2, 3	pending approval
	<b>Potentially Viable Projects</b>	Development Pending	2	2.1	1, 2, 3	feasibility evaluation of the ore deposit
	<i>Not all Potentially Viable Projects will be developed</i>	Development On Hold	2	2.2	1, 2, 3	care and maintenance retention
	<b>Non-Viable Projects</b> <i>Non-Viable Projects include those that are at an early stage of evaluation in addition to those that are considered unlikely to become Viable developments within the Foreseeable Future.</i>	Development Unclassified	3.2	2.2	1, 2, 3	resource assessment (geological interpretation, approximate calculation of the resource)
		Development Not Viable	3.3	2.3	1, 2, 3	closed abandoned historic
<b>Remaining Products not developed from identified Projects</b> <i>Remaining Products not developed from identified Projects or Prospective Projects may become developable in the future as technological or environmental- socio-economic conditions change. Some or all these estimates may never be developed due to physical and/or environmental- socio-economic constraints.</i>			3.3	4	1, 2, 3	
Potential Sources	Prospective Projects		3.2	3.1	4	subsurface exploration
			3.2	3.2	4	detailed surface exploration
			3.2	3.3	4	regional reconnaissance
	Remaining Products not developed from Prospective Projects		3.3	4.1	4	
			3.3	4.2	4	

UNFC Guidance Europe Annex I p. 19



# Main class: Remaining products not developed: E3;F4;G1-4

- Definition:
  - Quantities should only be classified as Remaining products not developed from projects where no technically feasible projects have been identified that could lead to the production of any of these quantities. Some of these quantities may subsequently be produced in the future due to the development of new technology.
- Examples:
  - A mineral resource of a commodity that is **reported but not produced**
  - **Commodity dropped** from company resource reporting

UNFC Classes Defined by Categories and Sub-categories						INSPIRE Code List	
Produced	Sold or used production						
	Production which is unused or consumed in operations <i>Future production that is either unused or consumed in the Project operations is categorized as E3.1. These can exist for all Classes of recoverable quantities</i>						
Total Products	Class	Sub-class	Categories				
			E	F	G		
Known Sources	Viable Projects <i>Estimates associated with Viable Projects are defined in many classification systems as Reserves, but there are some material differences between the specific definitions that are applied within different industries and hence the term is not used here.</i>	On Production	1	1.1	1, 2, (3)	operating continuously operating intermittently	
		Approved for Development	1	1.2	1, 2, 3	under development	
		Justified for Development	1	1.3	1, 2, 3	pending approval	
	Potentially Viable Projects <i>Not all Potentially Viable Projects will be developed</i>	Development Pending	2	2.1	1, 2, 3	feasibility evaluation of the ore deposit	
		Development On Hold	2	2.2	1, 2, 3	care and maintenance retention	
	Non-Viable Projects <i>Non-Viable Projects include those that are at an early stage of evaluation in addition to those that are considered unlikely to become Viable developments within the Foreseeable Future.</i>	Development Unclassified	3.2	2.2	1, 2, 3	resource assessment (geological interpretation, approximate calculation of the resource)	
		Development Not Viable	3.3	2.3	1, 2, 3	closed abandoned historic	
	Remaining Products not developed from identified Projects <i>Remaining Products not developed from identified Projects or Prospective Projects may become developable in the future as technological or environmental- socio- economic conditions change. Some or all these estimates may never be developed due to physical and/or environmental- socio- economic constraints.</i>			3.3	4	1, 2, 3	
	Potential Sources	Prospective Projects		3.2	3.1	4	subsurface exploration
				3.2	3.2	4	detailed surface exploration
			3.2	3.3	4	regional reconnaissance	
Remaining Products not developed from Prospective Projects			3.3	4.1	4		
			3.3	4.2	4		



# Case study: Vuohtojoki

## Case Study Topics:

UNFC classification from a historic estimate (non-active project) with little background information.

### Project Background

**Commodities:** Zn, Cu

**Location:** Kärsämäki

#### Project status:

A closed mining concession area (never mined). The mining company applied for closing the permit in 2018 and the mining authority gave final decision for closing the mining concession area in 2019. The original mining concession area was accepted 1978.

**Current holder/ownership:** No owner

#### Geology:

Located in E-W to NE-trending, subvertical volcanic-sedimentary sequence which belongs to the bimodal, primitive island-arc type; Eastern Volcanic Sequence of the Pyhäsalmi area. Massive and disseminated textures characterize the sulphides. Mineralization comprises of two main zones that extend from the surface well beyond the depth of 500 m. According to the work by GTK, there are 12, E-W to NE-trending, subvertical, 100-550 m long, 1-20 m thick ore bodies.

#### Project history:

Zn-Cu mineralization discovered 1940s. The first indication was a mineralized sample from a glacial erratic found by an amateur prospector in 1949. This, and similar samples found 1958, led GTK to discover the deposit by drilling into a ground magnetic and electric anomaly. In 1970s the area was investigated by an exploration company, and later another mining company took over the mining concession area. A junior exploration company occupied the surrounding area (claim) during 2006-2012.



# Case study: Vuohtojoki

## Resource and Reserves

Most recent resource from 1992 is a non-compliant estimate:

Type:	Company:	Year:	Date:	Calc Method:	Reference:
Resource		1992	NA	Non-compliant resource estimate	18

Category:	Indicated and inferred mineral resource
Tonnage:	0,7 Mt
copper	0,3 %
zinc	2,6 %
silver	8 ppm
gold	0,2 ppm
Cutoff:	NA

UNFC-classification:

Resources:	Mt	Cu%	Zn%	Ag ppm	Au ppm
Indicated and inferred	0,7	0,3	2,6	8	0,2

## UNFC Classification

E	F	G
<p>Project has not progressed to a stage where environment impact assessment would be performed.</p> <p>Environmental-socio-economic viability cannot yet be determined due to insufficient information.</p> <p>Project currently has no holder and is non-active</p>	<p>Technical development of the project has not progressed since the 1990s.</p> <p>Technical feasibility of a development Project cannot be evaluated due to limited data.</p>	<p>The non-CRISCO-compliant resource estimate was made in the 1990s</p> <p>The estimate is based on sparse drilling, and information regarding density and sampling is incomplete.</p> <p>No QA/QC protocols.</p>



slido



**How does the criticality of the raw material of a historic project affect its UNFC classification?**

**\*better in this context means a lower number, e.g. E1 is better than E2**

① Start presenting to display the poll results on this slide.



# GSEU

GEOLOGICAL SERVICE | FOR EUROPE

Thank you for your attention

Tuomas Leskelä, GTK

Lena Lundqvist, SGU

Antje Wittenberg, BGR

[www.geologicalservice.eu](http://www.geologicalservice.eu)



Funded by  
the European Union

