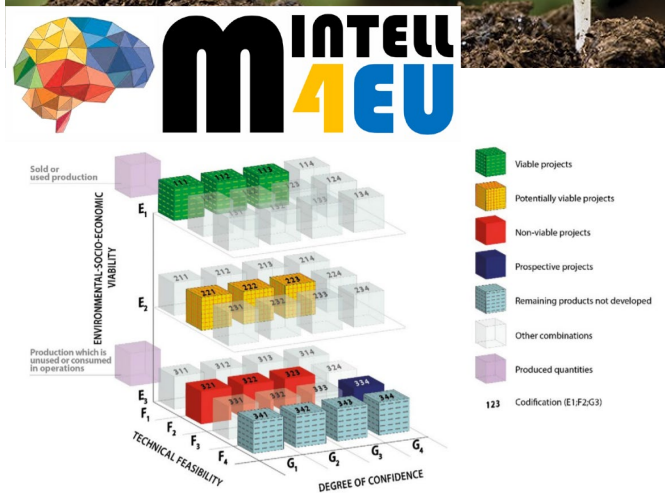

UNFC work in Mintell4EU

and UNFC on Norwegian Phosphate

Kari Aslaksen Aasly
Geological Survey of Norway

RESOURCE MANAGEMENT WEEK 2021

ENABLING SUSTAINABILITY PRINCIPLES IN RESOURCE MANAGEMENT

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What we are doing

- The European countries need a **common tool** to aggregate information for **continent wide** resource inventories
- In Mintell4EU we are testing if the United Nations Framework Classification is a tool that can be used by **geological surveys** to evaluate a country's known and potential resources.
- And we are also testing if the UNFC system can be used to provide better **harmonization** of mineral resource data nationally and across Europe.

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Case studies

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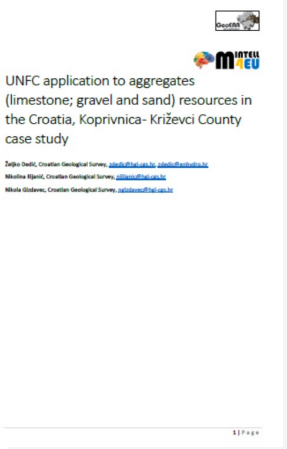
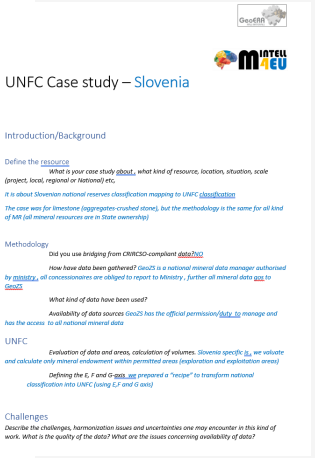

UNFC application to aggregates (limestone; gravel and sand) resources in the Croatia, Koprivnica- Križevci County case study


UNFC Case study – Slovenia

Introduction/Background

Define the resource

Methodology

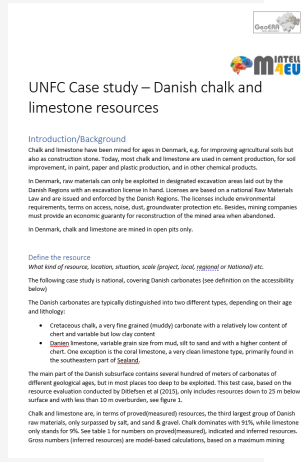
UNFC

Challenges

22 case studies

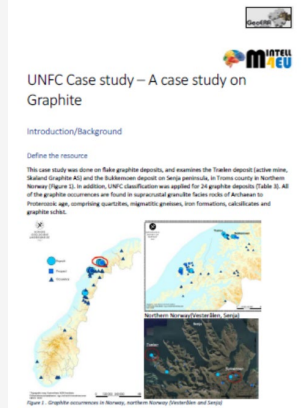
National, regional and local level

Country	Gold	Copper	Cobalt	Manganese	REE	Phosphate	Limestone	Graphite	Aggregates	Natural stone	Peat	Gypsum	Perlite
Austria									X				
Belgium						X							
Croatia							X		X	X			
Denmark							X		X				
Finland	X	X	X					X			X		
Hungary				X								X	X
Norway						X		X	X	X			
Slovenia							X						
Sweden					X								


UNFC Case study – Danish chalk and limestone resources

Introduction/Background

Define the resource


UNFC Case study – A case study on Graphite

Introduction/Background

Define the resource

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Experience from case studies

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- Case studies **shows that geological surveys can do UNFC on Raw Materials**
- The partners in MINTELL4EU have different levels of experience in UNFC and the **approach and methods** on UNFC varies between the countries. Stricter **guidelines** are required.
- **Data availability** is an issue as non-accessible data can result in less precision. In addition, not all geological surveys have the **responsibility** or data availability to be able to classify the E- and F-axis in UNFC.
- There is a need to compare the case studies and the surveys approach to identify **obstacles**, **data gaps** and **harmonization issues**.
- There is a need to work on the visualisation of UNFC

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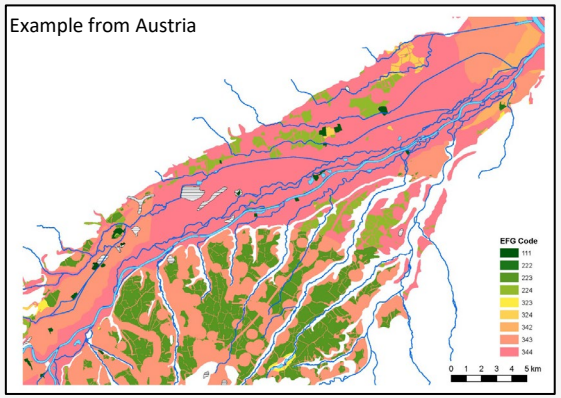
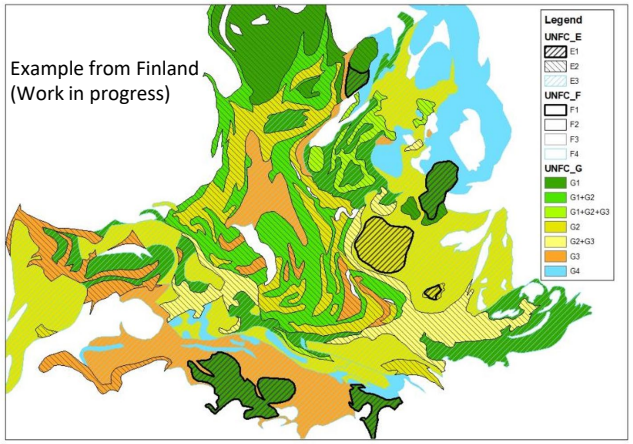
Deliverables from the project

- Report with **a case study review** with practical **guidelines/work flow** and examples of applying UNFC to European Mineral Resources (not nescessarily best practice….)
- Report on **harmonization issues, data gaps and challenges**, reviewing also the quality of the Pan-European aggregated inventories of selected commodities
- Doing a pilot on visualization of UNFC



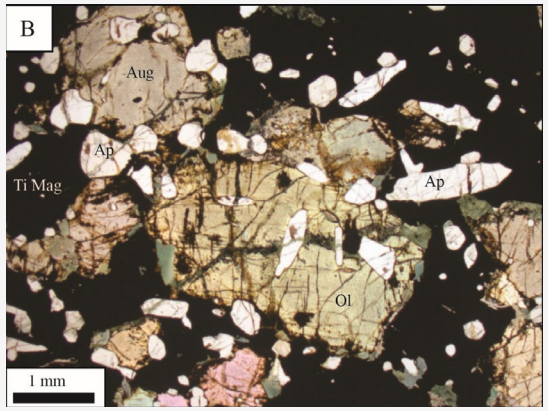


UNFC Case study

Phosphate

Agnes Raaness and Nolwenn Coint, NGU

- The most prominent phosphate bearing mineral in Norway is apatite of igneous origin.
- There are several known deposits and occurrences. Some have been well-known for several years, other are less known.



Overview of known apatite deposits in Norway.

UNFC Case study

Phosphate

- Only two of the deposits have JORC compliant resource estimates enabling bridging to UNFC: Kodal and Øygrei.
- Other deposits have resource estimates that are non-compliant and not done according to known classification standards. Hence, bridging is not an option for most phosphate deposits in Norway.
- Both published and unpublished data (geological reports and articles, company reports and more) have been compiled, mainly focusing on the quality, and performed activities at the various deposits.

Numbers and classification for the Kodal deposit.

	Gross				Net				UNFC bridging		
Category	**Mt**	**Grade**	**Mt**		**Mt**	**Grade**	**Mt**				
	P_2O_5 + Fe	**P_2O_5**	**P_2O_5**		**P_2O_5 + Fe**	**P_2O_5**	**P_2O_5**		**E**	**F**	**G**
Indicated	14,6	5,18	0,76		14,6	5,18	0,76		E2	F2.2	G2
Inferred Sub.	34,3	4,59	1,58		34,3	4,59	1,58		E2	F2.2	G3
Total	**48,9**	**4,77**	**2,34**		**48,9**	**4,77**	**2,34**		**E2**	**F2.2**	**G2+G3**

Detail for the most promising area of the Misværdal deposit

Locality	**Area**	**Apatite**	**P_2O_5**		**E**	**F**	**G**	**Comment**
Coarse-grained zone at Skaråslia	200mx650m	9.6wt%	4.1wt%		E3	F3	G3	Volume estimated down to 100 m depth.

UNFC Case study

Summary of UNFC classified apatite deposits in Norway

Deposit	Location		Mt in total	Grade		UNFC		
				Apatite [wt%]	P_2O_5 [wt%]	E	F	G
Bjerkreim-Sokndal	Zone A/MCI Ibe		43.1	8.30%	3.50%[E]	E2	F2.1	G3
	Zone B/MCU IIIe		95.7	7.8%	3.29% [E]	E2	F2.1	G3
	Zone C/MCU IV		216.9	10.2%	4.31% [E]	E2	F2.1	G3
	Øygrei (Constrained area containing mineralised rocks in MCU III and IV)	Ind. res.	800	4.36% [E]	1.84%	E2	F2.1	G2
		Inf. res.	750	3.86% [E]	1.63%	E2	F2.1	G3
		Total	1550	4.12% [E]	1.74%	E2	F2.1	G2+G3
Kodal		Ind. res.	14.6	12.27% [E]	5.18%	E2	F2.2	G2
		Inf. res.	34.3	10.87% [E]	4.59%	E2	F2.2	G3
		Total	48.9	11.30% [E]	4.77%	E2	F2.2	G2+G3
Misværdal	Skaråslia		41.47	9.60%	4.05% [E]	E3	F3	G3
Ødegården	Ødegården		38.28	2.37% [E]	1.00%	E3	F3	G3
Lillebukt	Lillebukt		28.71	7.11% [E]	3.00%	E3	F3	G3

E) Estimated using this formula:
wt% apatite = wt%P2O5
* 2.3695 to convert between wt% apatite and wt% P2O5.

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Summary

- **UNFC** is a tool that **can be used by geological surveys** to evaluate a country's known and potential resources.
- The UNFC system can be used to **provide better harmonization** of mineral resource data nationally and across Europe.
- We are at a **starting point** at establishing a more harmonised system and **stricter guidelines** are required

"As a geologist, assessing the G axis was assumed to be the "easy" part compared to the E axis and the F axis. However, following previously developed decision flow tools such as the ones developed in the ORAMA project, such as by Brown et al 2019, make the job much easier for all the three axes when in doubt. "

(Quotation from one of the case studies)

Thank you!

Kari Aslaksen Aasly
Head of Sections
Mineral resources
Natural construction materials

GEOLOGICAL SURVEY OF NORWAY
- NGU -

UNECE
Date 30 I 04 I 2021, Geneva

RESOURCE MANAGEMENT WEEK 2021

ENABLING SUSTAINABILITY PRINCIPLES IN RESOURCE MANAGEMENT

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