MINERAL INTELLIGENCE
FOR EUROPE

# Appendix to deliverable D4.3:

## GTK's proposal for visualisation of UNFC

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# 1 GENERAL

There is a growing need to visualise UNFC resources for map services. Visualisation of UNFC was not described as a part of the MINTELL4EU project, but as the project developed a need to look into this was identified. GTK was given the task to elaborate this and approached this need by creating a preliminary proposal for the visualisation of the UNFC codes. The resulting proposal was reviewed with NGU and GEUS, and then circulated to MINTELL4EU partners. All comments from the partners were considered and adjustments were made based on these. It must be noted that this is a pilot visualisation and based only on GTK's data, and it will not be implemented at the EDGI portal at this point.

Visualisation was made on dataset that was extracted from the updated GTK's MIN4EU dataset. Prior to data extraction, all the resource/reserve data were mapped to the UNFC code using bridging documents or by re-classifying old data according to GTK's guidelines created in the MINTEL4EU project (https://tupa.gtk.fi/raportti/arkisto/46_2020.pdf).

# 2 DATA

UNFC dataset was extracted from GTK's updated MIN4EU dataset. Attributes were needed from several tables, and these were combined and flattened into one table. In the future, it would be ideal to have the opportunity to extract data like this for UNFC resources in the MIN4EU database. Currently, such view does not exist, and thus separate dataset needed to be made.

| Table_name | Attribute_names |
|---|---|
| MineralOccurrence | location, name, inspireid, country |
| OreMeasure | calculationDate, classificationMethodUsed, maxQuantity, uomQuantity |
| CommodityMeasure | maxamount, uomAmount, grade, uomGrade |
| UNFClassification | unfc_e, unfc_f, unfc_g, unfc_e_comments, unfc_f_comments, unfc_g_comments. New attribute was added to this data set: 'UNFC code' combines separate UNFC categories into single attribute value e.g. E2;F2;G2 for labelling purposes. |
| Commodity | commodity, importance, rank |

Table 1. GTK's UNFC dataset was created using the MIN4EU database tables and attributes

The dataset was created using ETL-software (Safe Software FME). Output data formats were Esri Filegeodatabase and QGIS Geopackage. The symbology was made both in ArcGIS and QGIS.

For the purpose of testing the visualisation, a dummy dataset was created for polygons with the same attributes as in point dataset, as GTK's mineral resource data only exist as points.

| | | | | |
|---|---|---|---|---|
| **inspireid** | EarthResource/12 | EarthResource/12 | EarthResource/12 | EarthResource/12 |
| **name** | Kevitsa | Kevitsa | Kevitsa | Kevitsa |
| **unfc_code** | E2;F2;G1 | E2;F2;G1 | E2;F2;G1 | E2;F2;G1 |
| **commodity** | copper | nickel | platinum | palladium |
| **maxamount** | 124700 | 81700 | 7.74 | 4.73 |
| **uomamount** | T | t | t | t |
| **unfc_e** | E2 | E2 | E2 | E2 |
| **unfc_f** | F2 | F2 | F2 | F2 |
| **unfc_g** | G1 | G1 | G1 | G1 |
| **maxquantity** | 43 | 43 | 43 | 43 |
| **uomquantity** | Mt | Mt | Mt | Mt |
| **grade** | 0.29 | 0.19 | 0.18 | 0.11 |
| **uomgrade** | percent | percent | ppm | ppm |
| **importance** | largeDeposit | largeDeposit | mediumSizedDeposit | mediumSizedDeposit |
| **rank** | 2 | 1 | 3 | 3 |
| **classificationmethodused** | UNFCCode | UNFCCode | UNFCCode | UNFCCode |
| **calculationdate** | 31.12.2020 0:00 | 31.12.2020 0:00 | 31.12.2020 0:00 | 31.12.2020 0:00 |
| **unfc_e_comments** | Original method PERCCode. | Original method PERCCode. | Original method PERCCode. | Original method PERCCode. |
| **unfc_f_comments** | Original method PERCCode. | Original method PERCCode. | Original method PERCCode. | Original method PERCCode. |
| **unfc_g_comments** | Original method PERCCode. | Original method PERCCode. | Original method PERCCode. | Original method PERCCode. |
| **country** | FIN | FIN | FIN | FIN |

Table 2. Example of the GTK's data set

# 3 VISUALISATION OF UNFC CODE

Visualisation was made both for point and polygons layer.

As a starting point it was defined what needs to be seen on the map when making a visualisation of UNFC code, both the UNFC code itself but also the commodities. The size of the deposit was also considered important, but further investigation and testing showed that including this attribute would make the symbology very complicated to build.

UNFC categories were divided into separate layers, enabling the user to inspect one category at the time if needed. This decision was also based on the fact that at this point we do not know all the combinations of UNFC code that will really exist in the data. Dividing E, F and G category symbols in to separate layers will form unique combinations for each UNFC code without the need to update new existing combination to the symbology. See the legend for point symbols in Figure 1 and for polygons in Figure 5. Combinations of UNFC categories in GTK's data are shown in Figure 2.

Regarding commodities, it was decided that these needs to be divided into separate group layers to show the location of UNFC resources of certain commodities. This decision led to the conclusion that there is no need to create symbology based on commodities, only UNFC category symbology will be used. Commodities will be filtered to separate group layers allowing users to view one commodity at a time (see example on Figure 3). For this pilot visualisation, group layers were only created for a few commodities.

Colours for G category were selected to indicate geological confidence. Symbols for E and F categories overlay on top of G symbols. It was also noted that the colours might be challenging for those who have problems distinguishing colours. Labels for UNFC codes (e.g. E3;F3;G4) were added to G category layer (for both points and polygons). Labels will show when zoomed in (1:200 000 →). Labelling ensures that the map will be readable regardless of the colours as the information is not based on solely on the colours.

The fact that one deposit can have several UNFC classes within one commodity (e.g. 111, 112, 221, 222, 223, 344) caused challenges as these will overlap if shown in one layer. The solution was to bring the most important category to the top (in this case 111) and show with labelling if there are more UNFC classes in the same location (see Figure 4).

## 3.1 Points

Several styles and symbols were tested for the visualisation of the UNFC code, and in-house meeting was held with GTK's UNFC experts to decide the best way to present the data on a map. The final proposal is presented on Figure 1.

The E category is marked as a cross, which is on the top of the other symbols. E3 has the same colour as G4, so if the UNFC combination is 334 or 344, the cross will not show when both E and G layers are turned on. This decision was made to create a more aesthetic visualisation.
The F category is symbolised by the outline of the point. F4 has the colour same as G4, so if the UNFC combination is 344, the cross will not show when both F and G layers are turned on.
The G category is marked as a coloured point. G1 is green, G2 yellow, G3 orange and G4 light blue. Combinations G1+G2 and G1+G2+G3 are different shades of green, G2+G3 pale yellow.

The result is a symbology that shows UNFC code values in separate layers. It shows all the values of the UNFC categories, together or separately. This solution enables all combinations of UNFC categories. Sub-categories of the UNFC code will not be shown in the legend. Commodities will be filtered into group layers and the same UNFC symbology will be used for all commodities. Overlapping UNFC categories do not show, the most important will be shown on the top and labelling will reveal if there are more UNFC codes at the same point. All the attributes will be shown with Info tool.

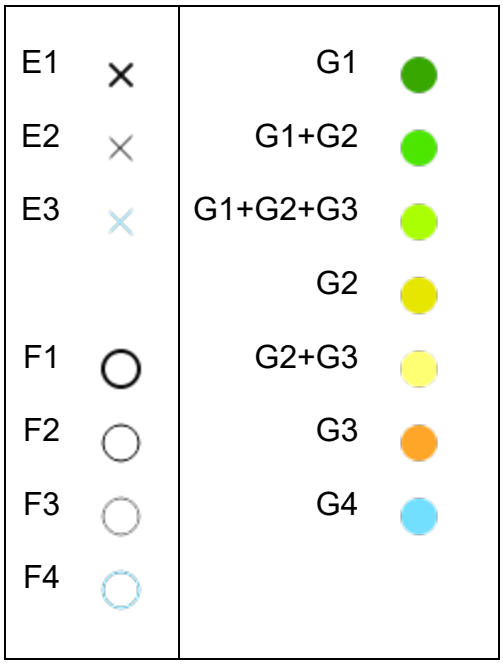

Figure 1. UNFC point data legend.

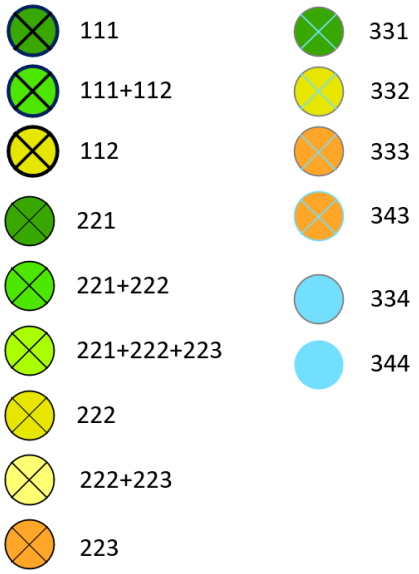


Figure 2. Combinations of UNFC categories in GTK's data.

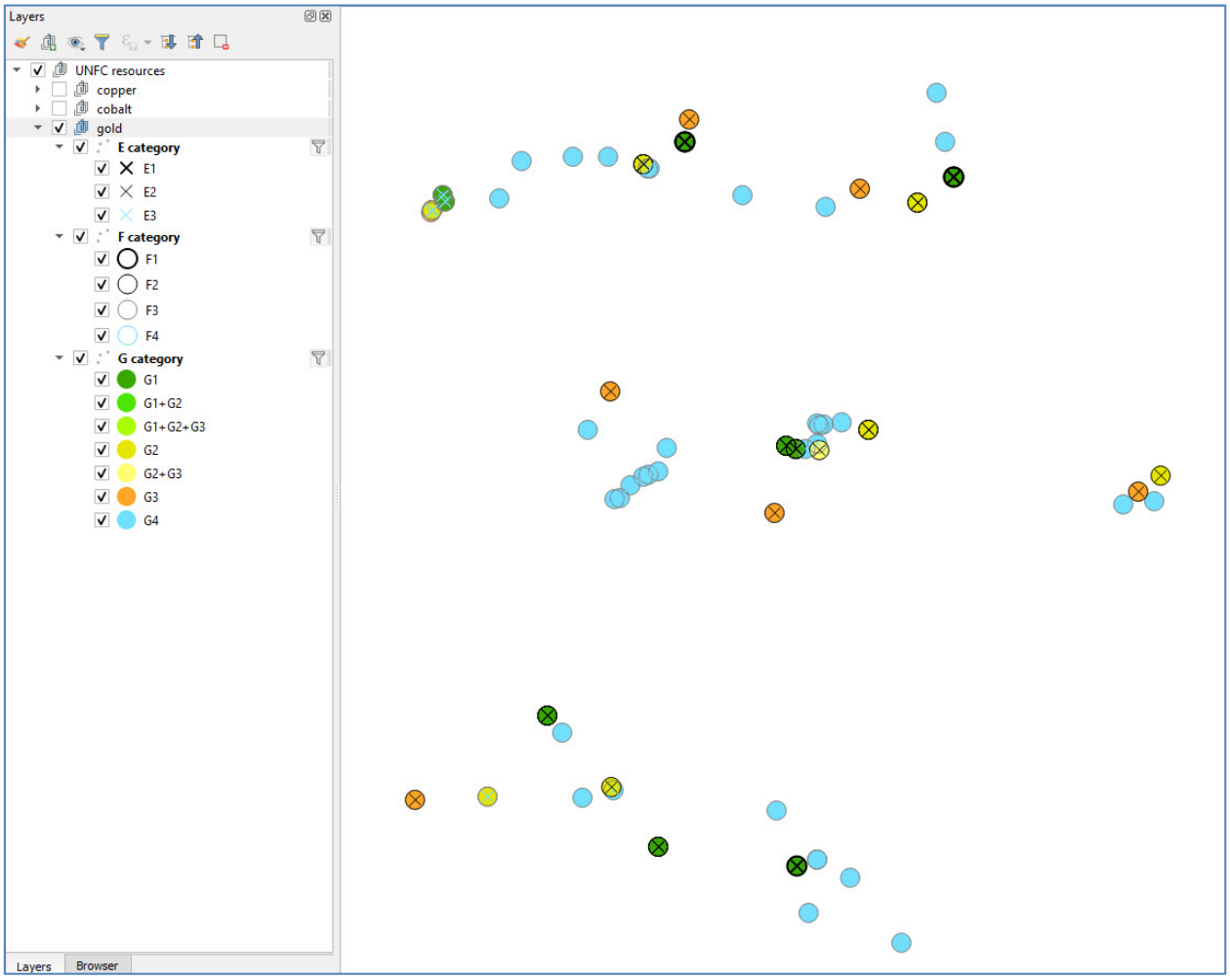


Figure 3. Map showing gold resources with UNFC classification.

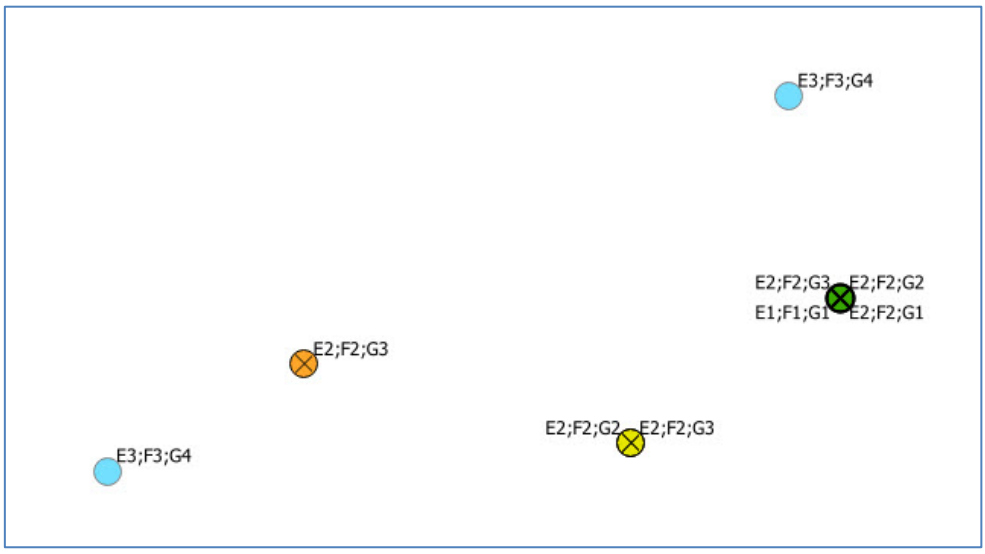


Figure 4. Closer view of the map shows UNFC codes as labels and reveals if there are overlapping UNFC codes.

## 3.2 Polygons

The visualisation of polygons was created using the same approach as for point data. Polygons were divided into separate layers showing E, F and G categories. The final proposal is presented in Figure 5.

The E category is marked with diagonal hatching, which is on the top of the other polygon layers. E3 has the same colour as G4, so if the UNFC combination is 334 or 344, the hatching will not show when both E and G layers are on. This decision was made to create a more aesthetic visualisation.

The F category is marked as the outlines of the polygons. F4 has the same colour as G4, so if the UNFC combination is 344, the outline will not show when both F and G layers are on. It is realized that outlines will not show in certain cases, like when the polygon with F2, F3 or F4 is surrounded by F1 polygons. This problem is solved by adding labels to polygons.

The G category is marked with the same colours used in point data.

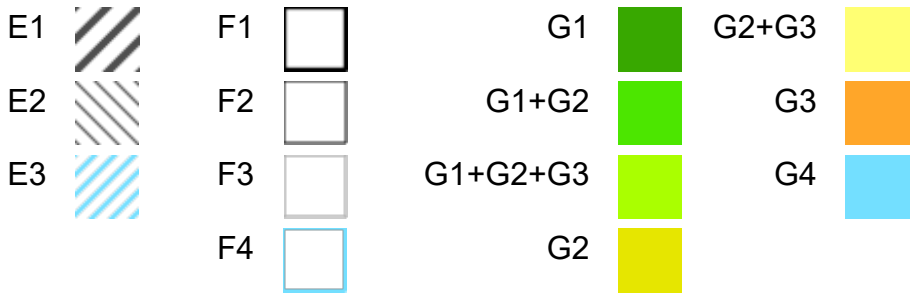


Figure 5. UNFC polygon data legend.


Figure 6. Example map of E category for polygons.

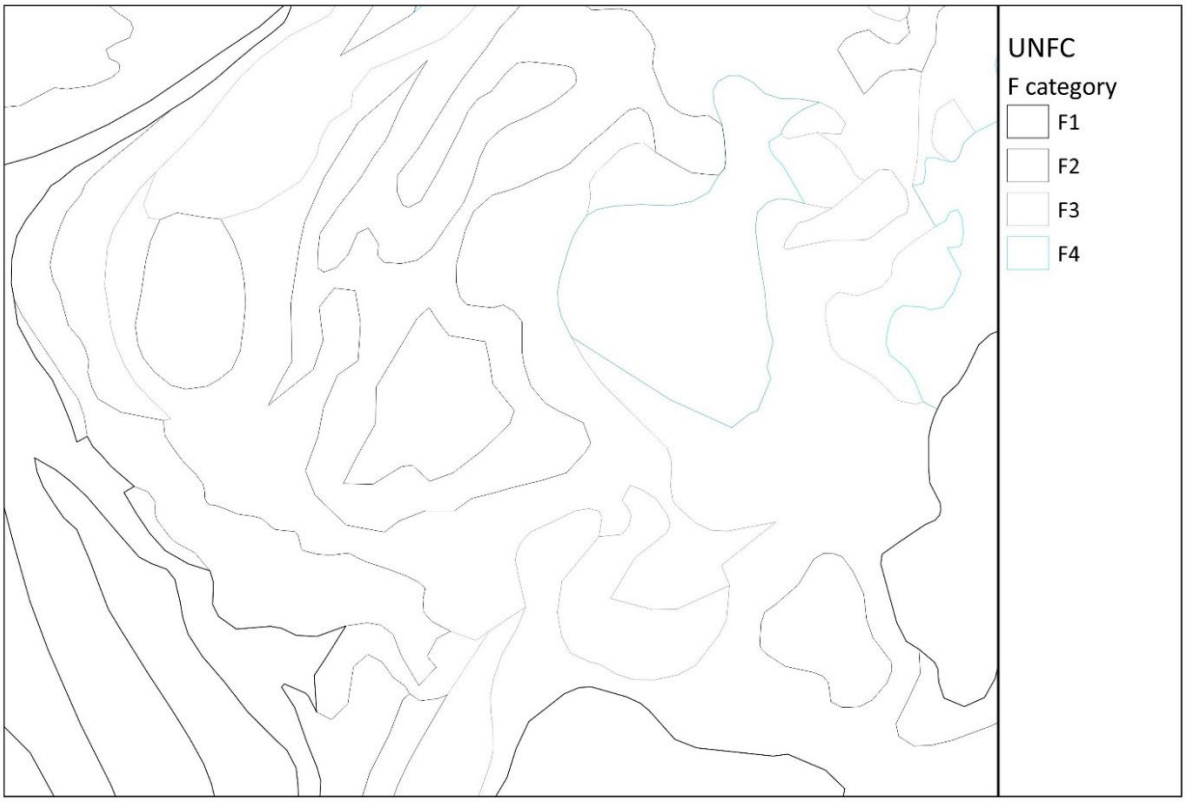


Figure 7. Example map of F category for polygons.

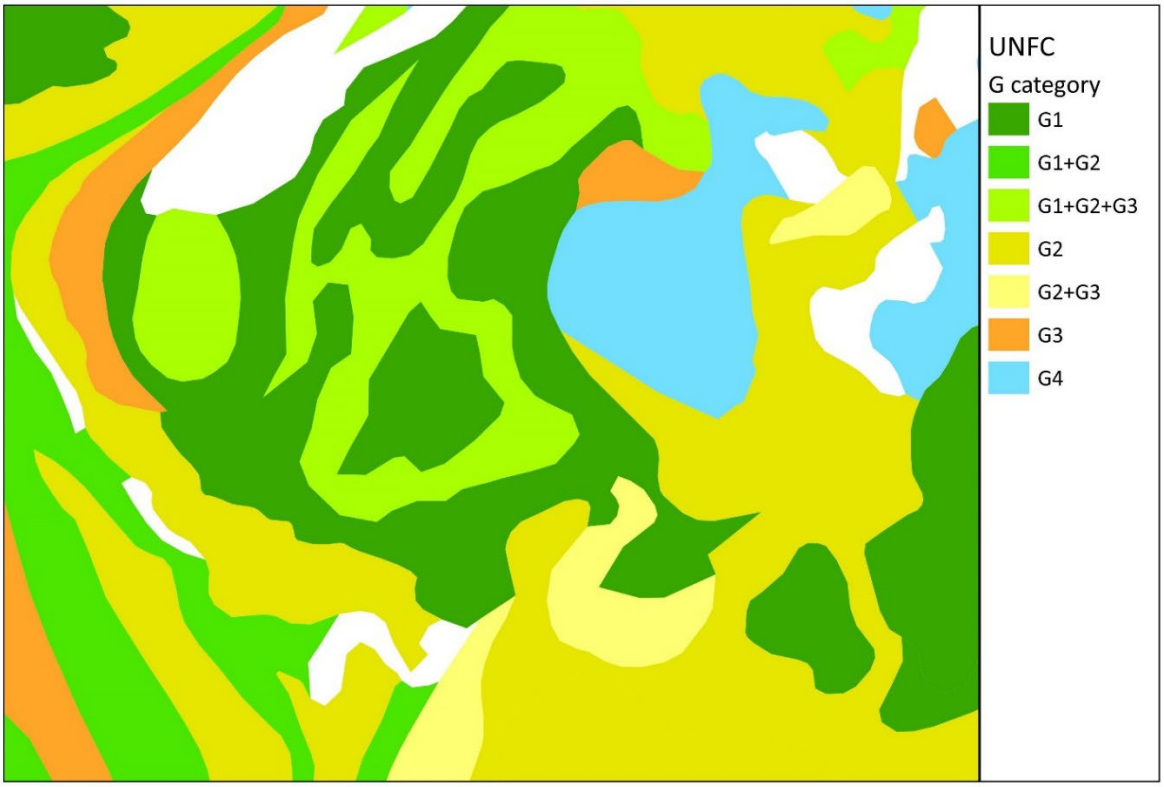


Figure 8. Example map of G category for polygons.

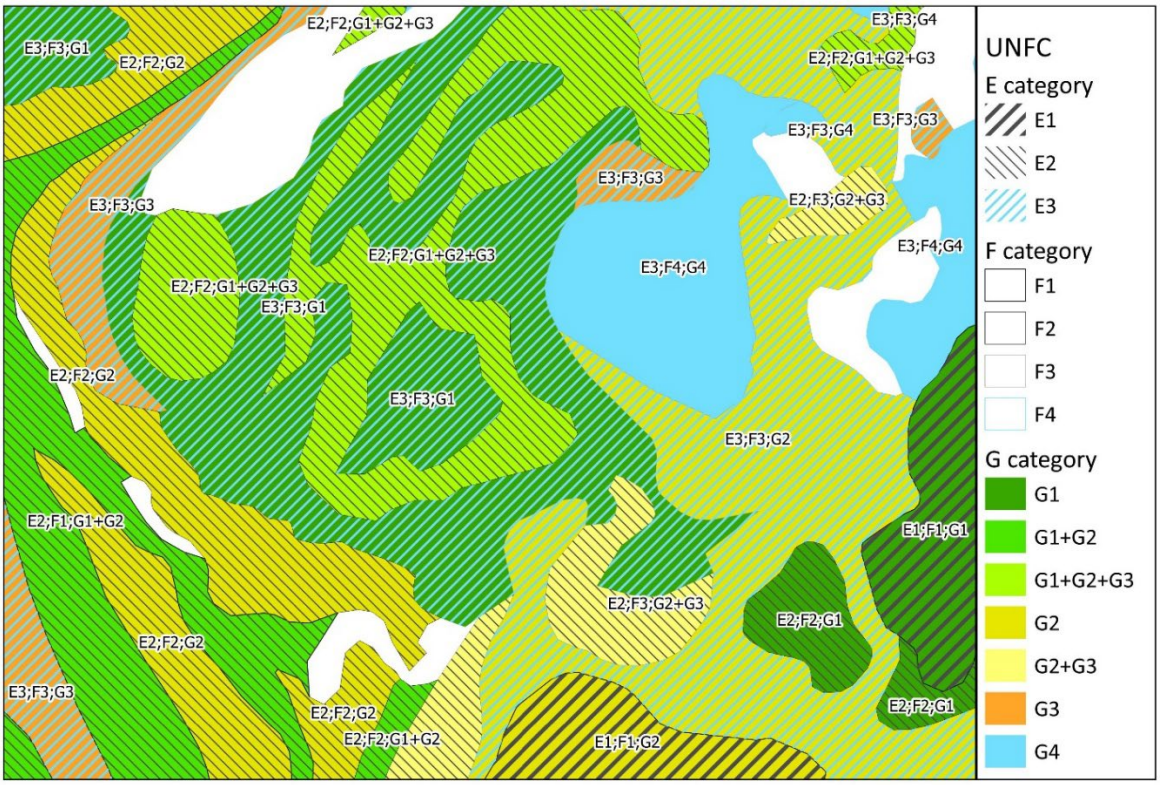


Figure 9. Example map with E, F and G category layers.

# 4 SUMMARY AND RECOMMENDATIONS

This proposal has been sent shared with MINTELL4EU WP4 partners for comments on visualising UNFC codes for points and polygons, two partners responded.

The first released harvesting of the new MIN4EU DB v2020.8 at 28th September 2021 show that only GTK have added UNFC information for 490 mineral occurrences (21st October 2021, Frands Schjøth, GEUS personal communication), so testing this proposal would be difficult at the moment.

We recommend to further develop this proposal on symbolising and use of colours for UNFC codes in future workshops and projects.

# 5 ACKNOWLEDGEMENT

This suggestion has been discussed in Mintell4EU WP4 group members:

- Taina Eloranta (GTK)
- Kari Aslaksen Aasly (NGU)
- David Whitehead (GEUS)
- Frands Schjøth (GEUS)

Thank you to the group members. The group finds this suggestion valuable for future discussions.