Information Integration of FAIR Data for New Discoveries of Past Mining Activities

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Preliminary work

In two earlier projects, one related to prehistoric, the other related to historic mining, FAIR data represented with CIDOC CRM (Bekiari 2022) have been created in addition to long lasting file formats both being deposited on ZENODO.

The first one of these projects is Ord4Mining-Archaeo short for *Open Research Data for Prehistoric Mining Archaeology*, which aims to make archaeologic data created in the DACH-project *Prehistoric copper production in the eastern and central Alps* (FWF I 1670) open and reusable for the scientific community investigating mining, technology transfer and trade connections in prehistoric times. Ord4Mining-Archaeo is an Open Research Data Pilot Project funded by the Austrian Science Fund (FWF ORD 74) (https://www.uibk.ac.at/projects/ord4mining-archaeo/index.html.de).

The second project *Text mining medieval mining texts* (TMMMT) is an interdisciplinary research project funded by the call "go!digital NEXT GENERATION" of the Austrian Academy of Sciences (https://www.uibk.ac.at/projects/ord4mining-archaeo/index.html.de). Focus of this project were two manuscripts for late medieval / early modern mining in the regions of Schwaz and Rattenberg/Brixlegg (Tyrol, Austria). The digitization and further information extraction from these documents has generated valuable information on mining rights and activities in the mining areas of these regions in Tyrol in form of person and mines register, Knowledge Graph, place gazeteer and maps.

Current status

In an ongoing project these FAIR data are reused for two purposes, one is to encounter yet unknown sites of prehistoric mining, the other is to create ontological modelling patterns that can represent archaeological and historical data of one topic in an integrated knowledge graph.

Finding New Sites

To encounter unknown mining sites the mines and mining areas from the previous projects were overlaid with high resolution digital elevation models to identify archetypical mining structures and areas where historical mining took place and hence prehistoric mining may have taken place. The search for these archetypical structures was also applied to areas without known prehistoric mining and investigated with field surveys. Figure 1 shows structures in a high resolution digital elevation that have first been identified as areas of visual interest and subsequently visited in a field survey.

An indication that prehistoric mining has occurred at this site are the dome shaped structures that indicate the fire setting technology to extract the ore from the rock.

Creation of Modelling Pattern

For the creation of modeling patterns the CIDOC CRM extensions (https://www.cidoc-crm.org/collaborations) CRMsci, CRMarchaeo, CRMgeo, CRMtex were used for the observed physical features or historic texts and CRMinf with CRMdig for the provenance of knowledge. As there is a need to specify the provenance of statements and not only instances experimental work has begun using RDFstar and named graphs to represent the complex provenance patterns that emerge from archaeological and historic research each applying their specific methodologies to obtain knowledge. Figure 2 shows a Knowledge graph of archaeological observations on sites and stratigraphic units and the beliefs that were created based on the observations using RDFstar.

References

Bekiari, Ch. et al., Volume A: Definition of the CIDOC Conceptual Reference Model. Version 7.2.2 [https://www.cidoc-crm.org/sites/default/files/cidoc_crm_version_7.2.2.pdf]