



PROPOSAL ON THE FUTURE USE OF THE AFP DATABASE

Background

In the framework of the regional German cooperation between the German Ministry for Economic Cooperation and Development (BMZ) and the International Conference on the Great Lakes Region (ICGLR), a regional technical cooperation project on "Transparency and Control of Mineral Supply Chains in the Great Lakes Region" was being implemented where AFP project was one module of the project. The Federal Institute for Geosciences and Natural Resources (BGR), which has developed the AFP method between 2006 and 2008, has been mandated by BMZ to run the AFP project that consists of implementing the AFP method on 3T's minerals in some ICGLR countries, Burundi, DRC, Rwanda, Tanzania, and Uganda.

The Analytical Fingerprint (AFP) was designed to verify the origin of 3T minerals in the Great Lakes region by laboratory analysis. However, the AFP is designed as an optional proof of origin within the 3Ts certification framework and seeks to complement existing CoC systems, thereby strengthening the integrity of the entire certification system.

The project ended with the following main deliverables:

- AFP sample preparation laboratories: These laboratories were set up to prepare sample minerals from the field into polished sections for subsequent AFP analyses. They were also equipped to prepare thin sections. Hence, three laboratories were established in Kigali, Rwanda (2013); Bujumbura, Burundi (2014), and Bukavu, DRC (2014). Two laboratories are functional (in Burundi and in DRC)

while one in Rwanda was operational until 2016 when the former Geological and Mines Department (GMD), later called Rwanda Mines, Petroleum and Gas Board (RMB), changed its premises. Both sample preparation laboratory operations are under the supervision of national geological surveys or national bureau in charge of mines, namely Office Burundais des Mines (OBM) in Burundi and Service Géologique National -Congo (SGN-C) in DRC.

- AFP central analytical laboratory: It was established and officially inaugurated in 2018 in Dar-es-Salaam, Tanzania, where it is intended to run mineralogical and geochemical analyses of AFP polished sections sent through the Analytical Fingerprint Management Unit (AMU).
- Analytical Fingerprint Management Unit (AMU): It is a unit under the supervision of the ICGLR Technical Unit on Natural Resources within the Democracy and Good Governance Program. AMU had the role of overseeing all AFP-related activities.
- AFP database hosted and managed by AMU: It is a database that contains field metadata of AFP samples taken during reference sampling campaigns as well as analytical datasets resulting from the analysis of samples according to the AFP analytical protocol.

Description of the AFP database

As provided by the revised RCM, the AFP is a complementary tool to be used to increase the credibility of the ICGLR Regional Certification Mechanism (RCM), the main tool of the RINR. The implementation of the AFP technology had delivered a database that was developed and fed through the sampling of 3T mineral mine sites, precisely sampling at pit level in Burundi, the Democratic Republic of Congo, and Rwanda. Later, some AFP sampling had been carried out in Uganda, where there were prospects for the application of AFP and the setup of an AFP sample preparation laboratory.

This AFP database is composed of interrelated tables that span from the field sample information to the analytical results of the concerned sample. The main tables of the AFP databases are:

- sample: where all information related to the mineral type, GPS coordinates of the mine location, administrative location of the mine, geological setting of the mine, mineral treatment is recorded, as well as any relevant information related to mine activities such as production and number of workers.
- pol_section: this table provides information on the analysed polished section, the laboratory that prepared it, and any relevant information related to the polished section.
- Mineralogy: for each analysed sample, this table is intended to present identified minerals in each polished section as well as their proportions in percentage (%).
- Geochemical (la_icp_ms): this table provides the concentration of major and trace elements in 50 grains for each analysed sample.
- Age: this table provides an estimate of the age of the ore bodies from which the mineral type was extracted, based on the concentrations of uranium and blade.

Status of the AFP database

The database file is more than 2 GB. It is hosted on a server operating Ubuntu Linux and accessed both through LAN and remotely via VPN. AMU is the one that has access to the AFP database. Counterparts (National geological surveys per country) had access to the file share service, where they sent information to AMU, and the latter sent them back only the mineralogical data. It is worth mentioning that every counterpart had only access to its respective folder and did not have access to the folders of other counterparts.

At the end of the project, the Analytical Fingerprint Management Unit gathered since 2011 till the end of the project:

Table 1: Number of reference samples taken on the mine site level and of control samples taken on the mineral supply chain (on the storage or comptoir)

Country	Reference samples	Mine sites	Control samples	Sampling sites (Storage/Comptoir)	Reference samples fully analyzed	Control samples fully analyzed
Rwanda	563	339	16	11	311	9
DRC	566	300	26	20	72	0
Burundi	166	79	41	35	50	6
Uganda	10	1	2	0	0	0
TOTAL	1305	719	85	66	433	15

Following the handover of the project to ICGLR, this brief note outlines the suggested pathway for the future use of this database in the same perspective of supporting the certification of minerals from ICGLR Member States.

Potential uses of the AFP database

1. The AFP database as a source of information on the mineral mine site and pit locations

As the main objective of the AFP method was to verify the plausibility of the origin of minerals through mineral characteristics, mineral samples had been taken at the mine site level, precisely at the pit level. It was crucial to inform precisely of the unique coordinates of the pit from which minerals had been taken.

Since a total of 700 mine sites had been sampled during the project life span, there is metadata of more than 500 pit points that can be mapped throughout the implementing countries. This can inform national institutions in charge of mines at the country level that can map their respective mine sites. It is worth mentioning that the AFP sampling campaigns had been done in collaboration with those respective national

institutions in charge of mines, and the latter may benefit the access to the data compiled together and may relate them to their national mineral database.

This also may inform external stakeholders who can retrieve geographical information on their mineral-supplying mine sites.

2. The AFP database as a source of information on the mineral proportions

AFP analytical data comprises AFP sample data from the field, AFP mineralogical and geochemical data from laboratory analyses, as well as the estimated age of the geological formation of ore bodies containing the minerals. The mineralogical data provides the proportion of minerals in % of mineral grains in a sample portion. This information helps in the identification of different minerals present in the sample portion and their respective proportions.

This information would be useful to national mining institutions to see the distribution of mineral types within a country and/ or a specific region. ICGLR can use mapping software like ArcGIS to inform the distribution of minerals based on the data.

It can also inform on the presence of other valuable minerals apart from tin, columbite-tantalite, and tungsten. For example, for the coltan sample, it can inform the proportion of niobium, which is also of great importance as of columbite-tantalite.

The mineralogical data can also be used as a basis for price negotiation, taxation, and may inform on potentially dangerous minerals that can impact health.

3. AFP database and ICGLR Regional Mineral Database

Considering the above-mentioned information that can be extracted from the AFP database and considering that the AFP database was already mentioned in the prototype of the ICGLR Regional Mineral database, this pathway could be explored to see if this information could be inserted into the ICGLR Regional Mineral database.

4. The AFP server, an asset to be used by ICGLR

The server that hosts the AFP database is a hardware component entitled Dell PowerEdge R620. It has a large memory (around 750 GB). With the AFP database hosted by the server, the remaining storage capacity of the server can host up to 5 virtual machines with their applications, other than the AFP database. According to the specifications of the server, the latter is great for virtualization, high-performance computing, and workgroup collaboration applications.

Important points to be considered

- **Remote access:** Access to the server is possible through the LAN or remotely. End users on the same network as in the AFP Management Unit can access the server if they are provided access. Also, the server can be accessed remotely through a VPN. Now, the AMU coordinator and data analyst are the only ones who have access to the AFP database. Counterparts (National geological surveys) had access to the file share service before the end of the project, where they sent information to AMU related to AFP samples taken during AFP sampling campaigns in their respective countries, and AMU sent them back only the mineralogical data later. Here, it is worth mentioning that every counterpart had only access to its data folder and did not access the folders of other counterparts. Remote access to the server is done through a VPN connection set in the Mikrotik" router that was solely providing internet service to AMU during the project lifetime. Now, the server needs to be connected to the router already provided by the ICGLR IT department, and there is a need to decide on who will have access to the server. If it will be decided that it is accessed by the public, a secure VPN connection could be considered, as a free vpn connection is the one being used.
- **Data to be published:** As far as the AFP data had been collected in the ICGLR Member States that were implementing the AFP method, the data are also owned by those countries. The latter

could be consulted to decide upon which data format they would prefer that their data be published in.

- **Ongoing maintenance of the database:** Regular updates of the database management software are necessary.

Conclusion

The AFP database is one of the key achievements of the AFP project. By ensuring its continuous maintenance and expanding its use among external stakeholders, it can serve as a valuable tool for tracking the origin of 3T minerals.

With the ongoing operationalization of the AFP regional database, there is an opportunity to explore about integration of the AFP database into the regional system, enriching national mineral databases. A sample table from the AFP database provides crucial information on mine site locations—data often missing from national databases. Notably, the geographical coordinates of AFP samples were recorded at the pit level, offering the most precise information on mineral sourcing. This level of detail is particularly valuable for external stakeholders interested in the exact origins of their minerals.

Additionally, the mineralogical table in the AFP database provides an approximate proportion of minerals in analysed samples. This data provides an estimate of 3T mineral concentrations and offers insights into the distribution of different mineral types across the country. Such information can support national mining authorities as well as external stakeholders, including mineral exporters.

By exploring the possibility of integration with the ICGLR regional database, the AFP database could enhance the availability and accuracy of mineral data, benefiting both national and international stakeholders.