

Faculty of Natural and Technical Sciences, University “Goce Delčev”-Štip, R. Macedonia with a grant from the CEI-ES Know How Programme organize



**1st INTERNATIONAL WORKSHOP
ON THE PROJECT**

**Environmental Impact assessment of the Kozuf
metallogenic district in southern Macedonia in
relation to groundwater resources, surface
waters, soils and socio-economic
consequences (ENIGMA)**

PROCEEDINGS

**Edited by:
T. Serafimovski & B. Boev
Kavadarci, 10th October 2013**

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ENVIRONMENTAL ACCESS DATABASE ORGANIZATION AROUND THE ALSHAR DEPOSIT POLLUTED AREA, REPUBLIC OF MACEDONIA

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Abstract

Numerous anthropogenic concentrations (AC) related to past or present metallic mineral resources mining has been determined at the territory of the Republic of Macedonia, but there was not a complete database with information for majority of them. During the past two decades we had collected satisfactory amount of data to organize anthropogenic concentrations database. Within this paper, through the software package “Microsoft Access” we made an effort to organize database with information of the most important anthropogenic concentrations (AC) related to past or present mining at the territory of the Republic of Macedonia. The architecture of the database is adapted for simple as well as sophisticated querying of particular Macedonian anthropogenic concentrations and allows edition of reports and a geographic display of the queried information.

Keywords: anthropogenic concentrations, deposit, Access database, reserves, resource.

Introduction

At the territory of the Republic of Macedonia there is not an organized database related to environmental mining pollution, and this is a one of first attempts, using Access Database to organize information about some representative mine and ore objects (active and closed) where we would like to give an accent to the old mine with former underground operations Alshar, which ceased its activities in 1965. The problem with environmental pollution around the Alshar mine has been generally related to several open adit waste dumps, whose contaminated water drained directly into Madenska River, which at particular places passes through or by open adit waste dumps where continuous decay of arsenic minerals (realgar, auripiment etc.) pollutes fresh waters with As, Sb, Hg, Tl etc.

The Alshar area is characterized by increased concentrations of arsenic, antimony and thallium. Increased arsenic and thallium concentrations have also been found in some plants such as Thimus and Viola [1], [2]. It can generally be said that the Alshar deposit contains about 500 000 tones of antimony ore (with 2.50 Sb) and about 1.50% As. Increased concentrations of thallium of 0.2% Tl (or some 40 tones of thallium ore) have also been determined.

The increased arsenic, antimony and thallium concentrations are a risk for the human environment along the River Majdanska, which empties into Blasnica and later the water flows into Lake Tikves.

It is of note that earlier mining waste dumps with large amounts of waste material that resulted from mining activities have been found in the riverbed of Majdanska. Increased concentrations of trace elements have been determined in the material and in the river sediments [2].

Organization of the Access database was carried out under the following main topics: general information, wastes and products, comments, iconography and bibliography. This is in accordance with the principles of GIS related mineral databases given elsewhere [3], [4], [5], [6], [7], [8], [9].

Discussion

As we have already mentioned above the organization of the Access database was carried out under the following main topics:

General information where has been enclosed information about the location, status, latitude/longitude, ore district name, comments etc. (Figure 1).

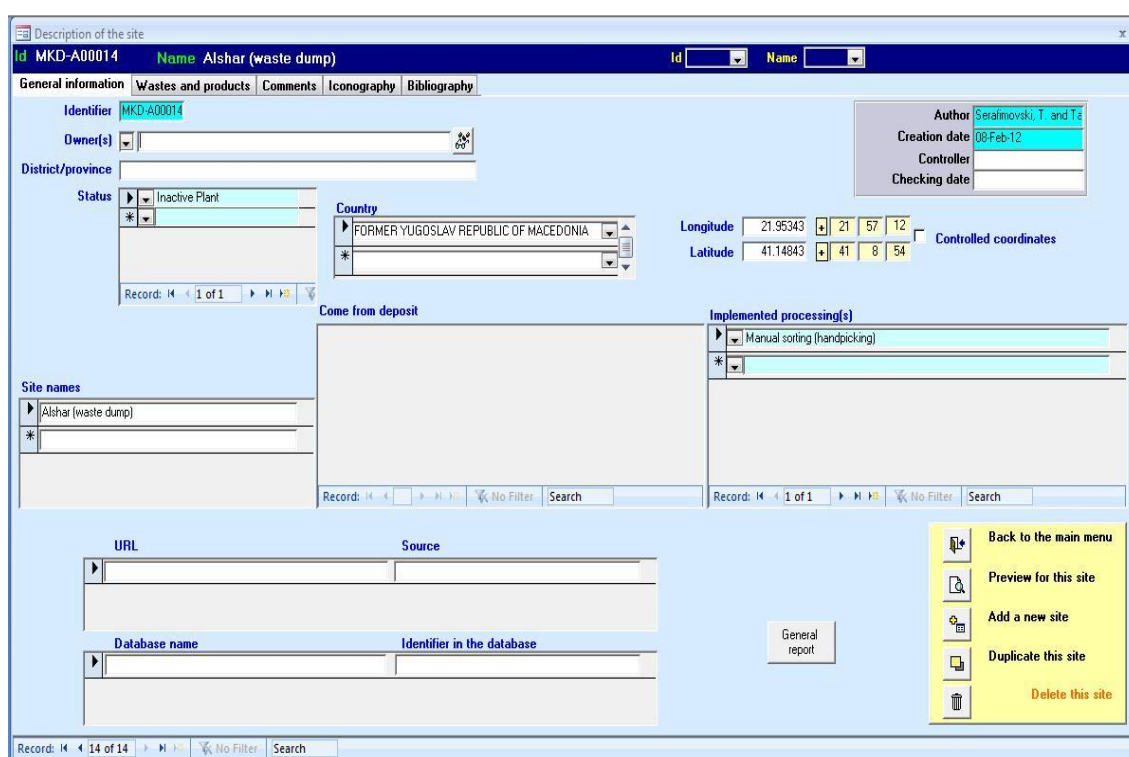
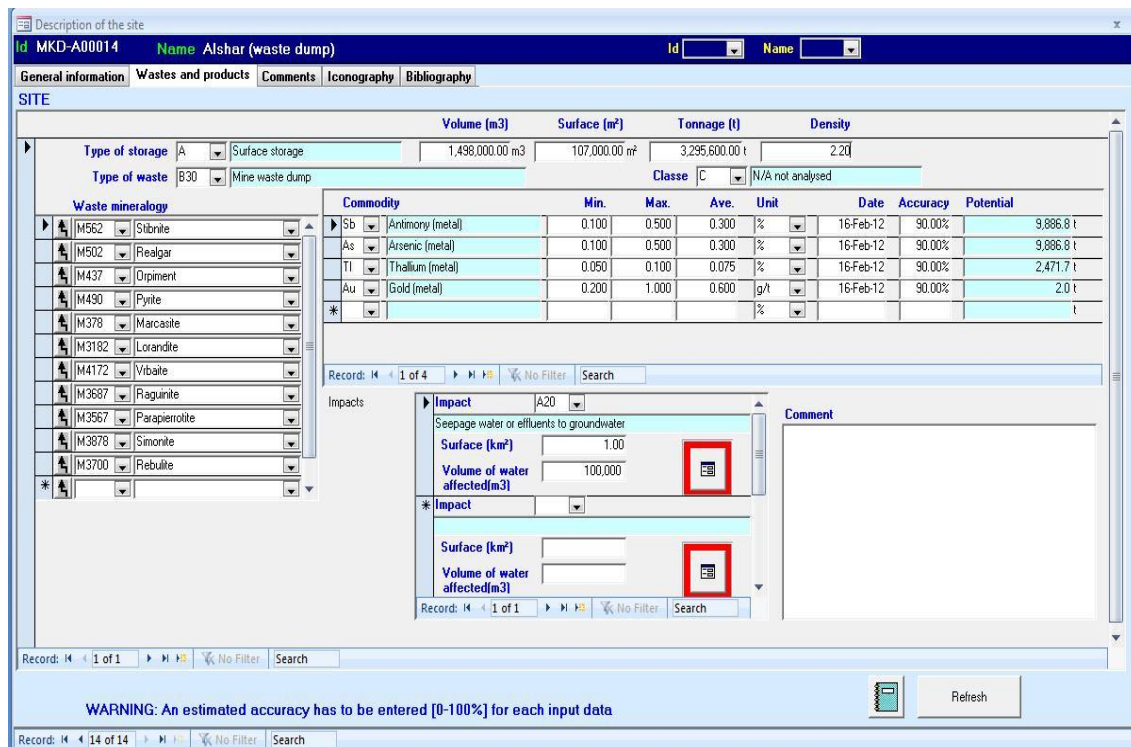


Fig. 1. General information datasheet of the database

For example on our sample of the Alshar deposit-mine related anthropogenic concentrations, we stressed out that is a an former inactive plant (mine), followed by detailed coordinates as well as familiar names used by locals for the mine and short general comments.

Wastes and products sheet is organized in a manner that should be given details about the parameters: type of storage (surface, underground,...), type of waste (mine waste dump, slag,...), volume and surface occupied as well as tonnage and density of a particular waste-product, waste mineralogy, particular commodity and affected water area (Figure 2). Here potential of specific commodities in the anthropogenic products (e.g. Sb, As, Tl, Au ...) related to certain host minerals was given, as well as grades (i.e. minimum, maximum and average grade) and abundance of host minerals in anthropogenic products.

For our particular locality, Alshar, we have entered data about all different kinds of Sb-As-Tl-Au minerals (stibnite, realgar, orpiment, lorandite, vrbaita, ragunite etc.). There the accent was given to the significant quantities of antimony, arsenic, thallium and gold with potential of 9886 tons for antimony and arsenic individually, 2471 tons for thallium and 2 tons of gold potential.



Wastes and products

Commodity	Min.	Max.	Ave.	Unit	Date	Accuracy	Potential
Sb Antimony (metal)	0.100	0.500	0.300	%	16-Feb-12	90.00%	9,886.8 t
As Arsenic (metal)	0.100	0.500	0.300	%	16-Feb-12	90.00%	9,886.8 t
Tl Thallium (metal)	0.050	0.100	0.075	%	16-Feb-12	90.00%	2,471.7 t
Au Gold (metal)	0.200	1.000	0.600	g/t	16-Feb-12	90.00%	2.0 t

Comments

Seepage water or effluents to groundwater
 Surface (km²) 1.00
 Volume of water affected(m3) 100,000

Fig. 2. Wastes and products datasheet of the database

Comments sheet, which is composed of space where it is possible to write free texts describing details about geology and/or details about economy of a particular deposit related to the anthropogenic concentrations gives a fine opportunity to describe particular concentrations in more details (Figure 3).

For example for our location, anthropogenic concentrations, around the Alshar deposit, we have entered detailed, up to date findings, about the type, size, geology and geological setting of the deposit related to the anthropogenic concentrations, details about the mining history of the locality (since 1881 and lasted with interruptions until 1965), with their representative eventual economic features as well as many other features such are past annual mine capacity, quantitative-qualitative parameters of produced ore, facility (facilities) where the raw excavated ore has been processed etc.

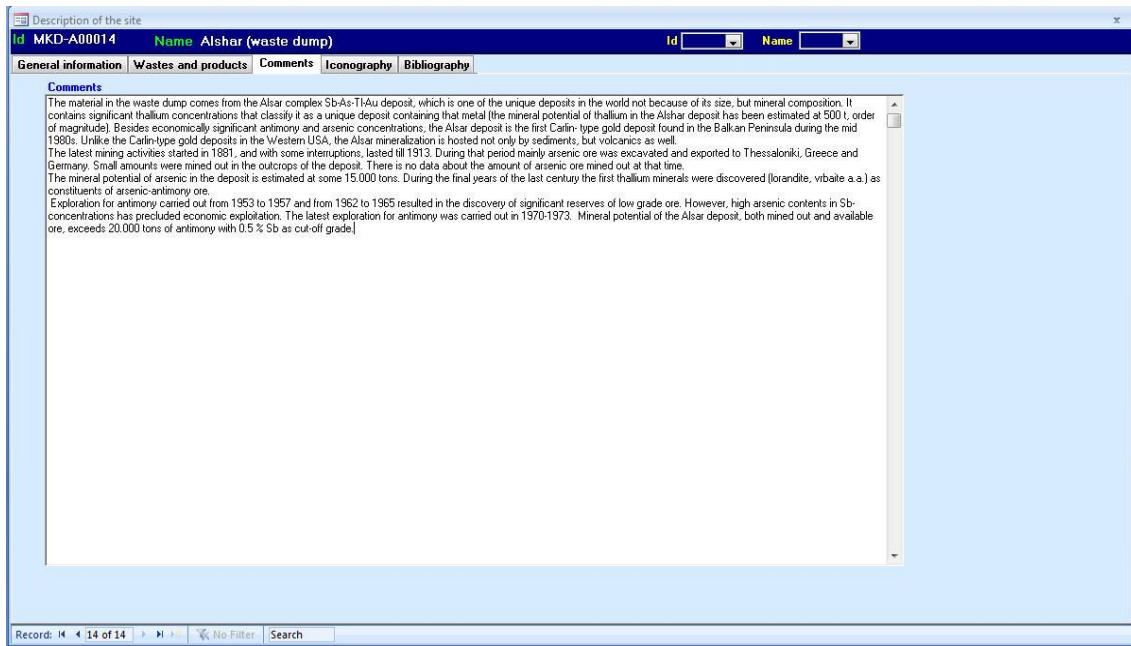


Fig. 3. Comments information datasheet of the database

Iconography sheet has been elaborated in order to attach images with an anthropogenic concentration. The first step being definition of paths of the image directory and the image viewer (e.g. Photo Editor, Windows picture viewer, Picasa...) by clicking on “Configuration” button (Figure 4).

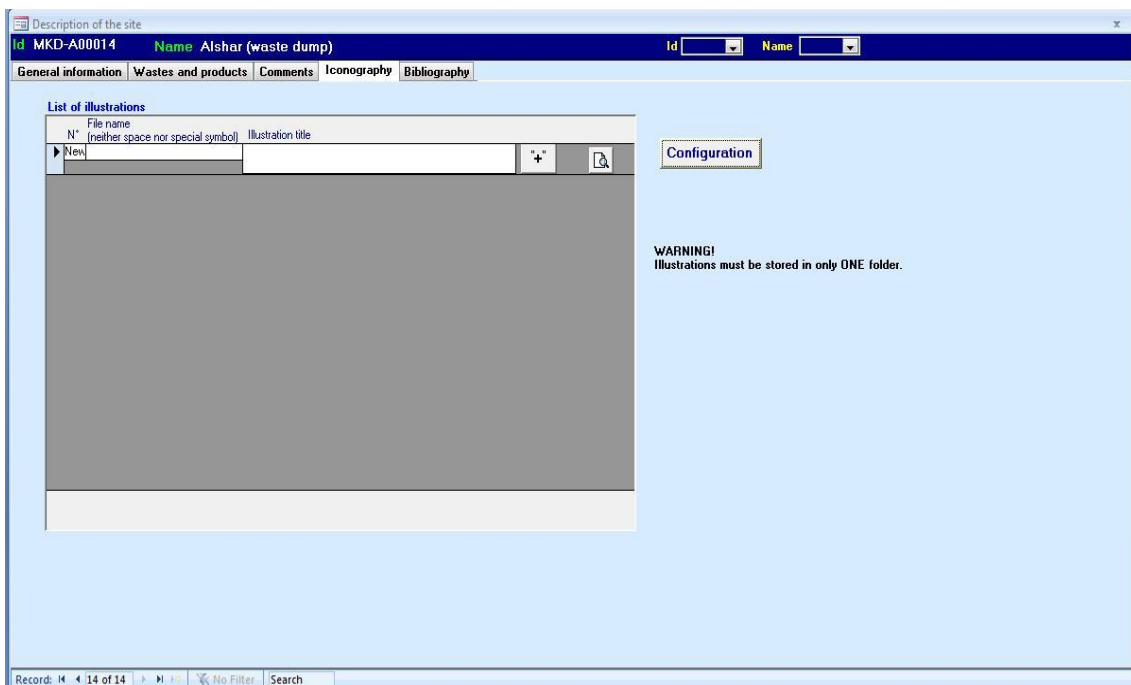


Fig. 4. Iconography information datasheet of the database

For all the aforementioned deposits, in regards to this data sheet, procedures were repeated with intention to upload as much as possible up to date images of mines, deposits and related anthropogenic concentration.

Bibliography data sheet for particular anthropogenic concentrations was intended to give an overview of available bibliography (references relating to the anthropogenic concentrations) and economical bibliography (references relating to economic data of the anthropogenic concentrations) as can be seen at Figure 5.

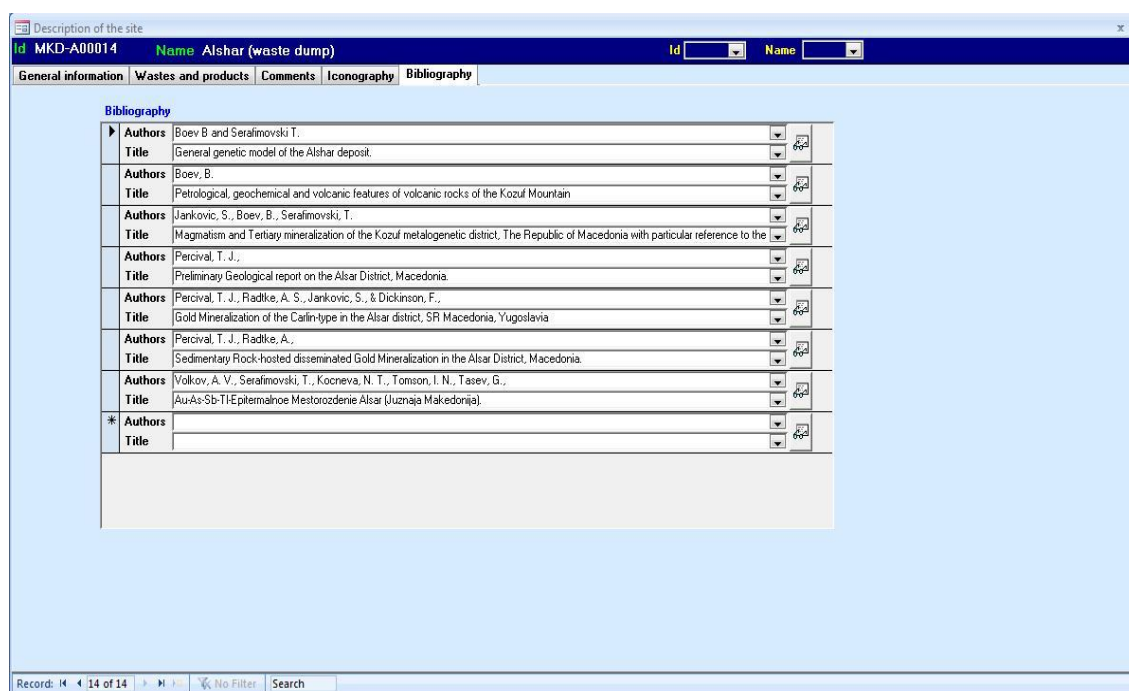


Fig. 5. Bibliography information datasheet of the database

On our example deposit, the Alshar anthropogenic concentrations, we have made significant input in regards to both types of bibliography, geological and economical ones. All the known and commonly used references to this particular deposit has been covered in this data sheet.

Conclusion

Ours preliminary attempt to establish the Access database for specific examples of anthropogenic concentrations at the territory of the Republic of Macedonia was successfully implemented. All known anthropogenic concentrations and related ore deposit types has been systematized in the database. The major accents in the database systematization were given to the qualitative-quantitative parameters and natural indicators in function to present and future valorization of metals (copper, gold, lead, zinc, antimony, silver, iron, nickel etc.) that were subject to the establishment of the database, in accordance with professional anthropogenic concentrations Access databases.

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References

- [1] Boev, B. and Lepitkova, S., 2002. Microelements in the Soils and Ashes of the Plants Viola Allsharica and Thymus Allsharensis in the Allshar Site-Macedonia 7th International Conference of the Biogeochemistry of the trace elements SYM01, 64-66
- [2] Boev, B. and Lepitkova, S., 2005. The Alshar Polymetallic Deposit and its Impact on the Water in Lake Tikves. 3rd International Workshop on the UNESCO-IGCP Project: Anthropogenic effects on the human environment in Tertiary basins in the Mediterranean, Stip, 21st October 2005, pp. 70-76.
- [3] Albert, J.H., and Rossman, A.J., 2001, Workshop statistics: Discovery with data, a Bayesian approach: Emeryville, Key College Publishing, 350 p.
- [4] Barnett, C.T., and Williams, P.M., 2006, Mineral exploration using modern data mining techniques: Society of Economic Geologists, Special Publication 12, p. 295–310
- [5] Cassard, D. and Itard, Y. (2003): Metallogenic and environmental information systems: A modern tool for the sustainable development of mineral resources. In: Tvalchrelidze, A.G. and Morizot, G. (eds.): Mineral resource base of the Southern Caucasus and systems for its management in the XXI century, NATOScience Series, IV. Earth and Environmental Sciences, **17**, 167–180.
- [6] Goodchild, M. and Dopal, S., 1989. Accuracy of spatial databases. Taylor & Francis, London.
- [7] Harris, J.R., Wilkinson, L., Heather, K., Fumerton, S., Bernier, M.A., Ayer, J. and Dahn, R. (2001): Application of GIS processing techniques for producing mineral prospectivity maps—a case study: mesothermal Au in the Wayze Greenstone Belt, Ontario, Canada. Natural Resources Research, 10, 91–124
- [8] Itard, Y., Geiller, M., Cassard, D. and Lips, A.L.W. (2002): Environmental dimension of a regional metallogenic synthesis: a way towards a sustainable extractive industry. GIS in Geology Int. Conference, Vernadsky SGM RAS, November 13–15, 2002, Moscow, Extended abstracts volume, 51–53.
- [9] Vuollo, J., Cassard, D., Simons, B. and Seymon, A., 2010. The Earth resource data exchange model (EarthResourceML)—a tool for delivering ProMine and INSPIRE mineral resource data: INSPIRE Conference 2010 Presentation, Krakow, Poland, 37 p