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Project acronym: **iVAMOS!**

Project title: iViable Alternative Mine Operating System!

Funding Scheme: Collaborative project



Mine Site Data Collection – Smreka, Vareš

Dissemination Level		
PU	Public	
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	<input checked="" type="checkbox"/>

Ref	Query	Status
1	Current Status	
1.01	What is the mine currently used for?	Smreka is abandoned open pit of the iron mine from 1990. The mine currently used for recreation (unofficial): fishing, swimming.
1.02	Who are the stakeholders we should be aware of?	Concession owner "Iron mine Vareš", Vareš municipality, FORRV.
1.03	Do you have a most recent map of the area?	Yes, old map of mine (exploitation period), no new map with lake (situation from 1986.)1:10.000
1.04	How accurate is Google Earth?	Yes, good accurately
1.05	What are the facilities that are available for using during the tests?	Noting of the facilities
1.06	How much power supply is available for us?	Noting of power supply
1.07	What is the situation of the access roads?	Access roads are good.
1.08	Are there any buildings we have access to? Office? Lavatories?	There are not on the site any object.
1.09	Who is the owner and who has the keys? Rent?	The owner is private without permit for ore exploitation .
1.10	Can the area be closed off?	No
1.11	Do we have 24/7 access?	Yes
1.12	Are we allowed to work 24/7?	Yes
1.13	How is the access to the water?	Good, over beach on the coast lake approx.100 m long and approx. 5 to 10 m wide.
1.14	Are we allowed to prepare the area? Earth moving? Stelcons? Temp construction?	That should be decide on the field, does it necessary?
2	Geology	
2.01	description of general geological and geomorphological setting	The area of Bosnia and Herzegovina is included in the middle parts of the Dinaridic Mountain System and it is positioned between Apulia (Adriatic Microplate) in the south and the Panonian and South Tisia, respectively. Main large lithofacies associations of the Dinarides originated during the Alpine orogenic cycle
2.02	description of the regional geology – lithology and structure	This regular pattern in the distribution of tectonostratigraphic

		<p>units is disturbed by allochthonous Paleozoic-Triassic formations which are thrust onto the units of the Internal Dinarides and onto the northeastern margin of the External Dinarides. The Paleozoic-Triassic Nappe has a very important role in structure of the Dinarides. In many areas, the Dinarides are disconformably overlain by postorogenic Oligocene, Neogene and Quaternary sediments. Allochthonous Paleozoic-Triassic formations included: Una-Sana Nappe, Golija Nappe, Durmitor Nappe, Klju-Raduša Nappe and Tectonic block Mid-Bosnian-Schist Mts.</p>
2.03	cross sections and descriptions of the formations, major geologic structures and aquifers	<p>Vareš area is included in the <i>northwestern part Durmitor Nappe</i>. The <i>Durmitor Nappe</i>, which is characteristic for the southeastern Dinarides, is composed largely of Triassic carbonates accompanied by subordinate clastic, siliceous and igneous rocks.</p> <p>Geological mapping and exploration drilling in the area of Vares were determined Lower Triassic, Middle Triassic and Jurassic formations. Lower Triassic formations determined to be developed in two ways: One; predominantly sandstone developed is called (“north”-local name) and sand-clayey one with layers of limestone and marl, called carbonate development or (“south”-local name). Lower Triassic sediments of carbonate development are ending by porous “travertionus”</p>

		<p>limestones that are marked as transitory sediments from Lower to Middle Triassic.</p> <p>Smreka deposit, structural-facial zones of mineral position:</p> <p>In the Vareš region in the Triassic formations, three structural-facial zones with structural units can be separated. Structural-facial zones are separated by overthrusts. Thrusting is the main distinctive feature of the Vareš tectonic structures. During geological investigations it has been noticed that sulfides occurrences were mainly related to the structural-facial zone A and B. In the structural-facial zones C, sulfide occurrence have not yet been registered.</p>
2.04	description of the geochemistry of the various rock units	<p>Spilites, keratophyres, tuffs and chert appearing in the same level with Fe-Mn sediments (hematite, breccias and kremezen-kalk, porous limestones) are marked as transitory formations between Anisian and Ladinian. For these formations some occurrences of non-ferrous metals sulfides are connected.</p> <p>Ladinian formations are significantly wide spread in the Vareš region and according to their lithofacial features, they are very striking and are easily noticeable. There are two levels to be distinguished:</p> <p>Stratified chert with tuffaceous shales and sandstones and stratified limestones with chert that are mostly of dark-red colour with transitions into grey and greenish.</p> <p>Jurassic sediments are wide-spread around Triassic formations. They</p>

		are represented by marls, limestones, shales and breccias.
2.05	What is the latest geological survey?	1986.
2.06	What is the mineral of interest?	Iron (Siderite FeCO_3 i Hematite Fe_2O_3)
2.07	What is the overburden?	Limestone, silicates mix rock, manganese.
2.08	Where does the water come and where is it going?	Water come in lake from rain/snow and brooks and going to the Stavnja river, level of lake don't have change.
2.09	Is there a water table level we should observe?	No
2.10	Any seasonal influences?	Higher water from rain and snow and ice during winter time.
3	Past exploration works	
3.01	exploration drill-holes with the description of geological, hydrogeological, physically-mechanical and other measured parameters of lithological units and possible changes that could arise, geophysical investigations	All available data will be prepared.
3.02	Are there any special heritage sites that we should leave intact?	None
3.03	How long has the mine been in operation?	Since 1975 to 1992
3.04	How much material has already been removed?	Aprox.1 million tons (ore)
3.05	What were the weekly production rates?	15 – 20.000 tons/week
3.06	Why was the mine closed?	The war in BIH, 1992
3.07	What would be the incentive to reopen the mine again?	Economical interests on the market. Capital for investment in reopen the mine again
3.08	How was the mine used after closure?	The private owner
3.09	What reconstruction has been done for the current use?	Investment and renewal infrastructure of mine
3.10	Can we receive the old mining plans?	We have some data, will be delivered
3.11	Can we access old soil samples and the soil reports?	We have some data, will be delivered
4	Waste rock, wall rock and ore characteristics	
4.01	characterize the geochemistry of the waste rock, wall rock and ore in order to determine the potential for	Not applicable

	leaching of metals and other contaminants at the mine	
4.02	geotechnical investigations (side wall and pit edge stability; the presence of unconsolidated sediments)	None
5	Sediments	
5.01	determine the chemical and geotechnical properties of the sediments, including measurement of soil mechanics and composition	None
6	Water quality at the site	
6.01	water characteristics at various depths – temperature, particles, dissolved gas; chemical parameters of water (pH, Eh, dissolved metals and other dangerous substances if needed, like cyanide, petroleum)	Measured surface water properties: Ep=894 $\mu\text{S/cm}$ (electro-conductivity); TDS=573mg/l (total strongly elements); Salt = 0,4; T = 22,8 °C (water temperature) – Air temperature: 30°C/ Summer time – July 7, 2015 $\delta = 1116 \Omega\text{cm}$ (specific resistivity) pH = 8,7
7	Surface waters	
7.01	identify all nearby rivers, streams, wetlands and other water bodies as well as the current uses of the water	Smreka lake, Stavnja river, streams: Brezovac ($Q_{sr}=10 \text{ m}^3/\text{h}$), Zabuković, Raškovića, Vučiji potok. No wetlands
7.02	determine baseline rainfall, runoff and erosion characteristics as well as flooding characteristics of rivers and streams nearby and adjacent to the mine	Not applicable
7.03	determine the boundaries of the watershed	It will be defined possible
7.04	determine the nature and extent of pollutants discharged throughout the watershed	Not applicable
7.05	determine the potential additional pollutants discharge from the existing mine	Historic industrial waste and mine waste water as the potential additional pollutants discharge from the existing mine
7.06	monitor field parameters (pH, specific conductance, temperature, etc.) and laboratory analysed parameters (total dissolved solids, total suspended solids, selected trace metals, major cations/ anions and other potential pollutants identified in Risk assessment) upstream and	Not applicable

	immediately downstream of potential pollutant sources	
8	Groundwater	
8.01	perform hydro-geological investigations: identification of water protection areas, possible abstraction wells in vicinity, determination of hydraulic conductivity and groundwater levels permeability, preparation of hydrogeological map	There is in hydro-geological map
8.02	monitor field parameters (ground water levels, pH, specific conductance, temperature, etc.) and laboratory analysed parameters (total dissolved solids, total suspended solids, selected trace metals, major cations/ anions, other potential pollutants identified in Risk assessment) in the monitoring wells upstream and immediately downstream of potential pollutant sources several times in the period of at least one hydrological year	None
9	Air quality and climatic conditions	
9.01	collection of climatic data for local weather stations (historic rainfall data, wind direction and speed, solar radiation, evaporation rates and temperature variations)	Climate is temperate continental-per-mountain type. Average of temperature is 7,5°C . Coldest of month is January, average of temperature is -2,5 °C ; The warmest is July with average of temperature is 33,2 °C; Rainfall date total per year: approx. 1060 l/m ² , typical for continental zones, minimum of falls is in February with 72 l/m ² ; Snow covering region is from October to April; No strong wind, windy. Wind speed:1-2m/s; Wind direction: North or north-southerly wind Solar radiation: 950 KWh/m ² to 1100 KWh/m ² per year
10	Ecosystems	
10.01	determination of biological components and communities	The second major resource our municipality disposes of is forest. Around 74% of municipality

		territory (28.750 ha) is covered in forest, with an exceptional natural growth of rich plant diversity. Approximately 23% of municipality territory (8.830 ha) is agricultural area and around 2% has been devastated as a result of previous industrial production.
10.02	identify whether the site or surrounding area has particular species that may be under threat	On the area location „Smreka“ do not have endemic and rare kind of plants and animals. (There are not endemic flora and fauna)
10.03	describe timing of important seasonal activities (nesting, breeding, migration, etc.) for species that could be affected by mining activities	Not applicable
10.04	record in dominant species baseline levels of metals that may be released during mining	Not applicable
10.05	definition of possible restriction areas (Natura2000, ecological protected areas, Ramsar wetland areas) and restrictions according to spatial plans, visibility in local environment landscaping	None ecological protection areas (Natura 2000, Ramsar wetland areas)
11	Socio-economic conditions	
11.01	population and cultural characteristics	Municipality of Vareš administratively belongs to the Zenica-Doboje Canton, and is located 74 km from Zenica; from Sarajevo, 46 km, 85 km from Tuzla. The municipality spreads over 390 km ² , currently with 26 local communities the population of the Vareš municipality is estimated at 10.000 inhabitants. (Before war, population of Vareš municipality: 22.200 inhabitants, Vareš town: 6.000 citizens.) Currently there are 1.300 people on evidence in the local Employment Bureau as unemployed while 1.129 people are employed.
11.02	societal susceptibility to mining (social licence for mining)	Mining and metal processing is a centuries old tradition in Vareš dating back to Illyrian, Roman, Medieval, Ottoman and Austro-

		Hungarian periods. The riches of our mineral resources (iron ore, lead, barite, zinc and silver) lay testament to this and today we are counting on utilizing this exceptional mineral potential. Habitants of municipality have worked long time in mines of this area. They would like to see the mine in operation again.
11.03	regulatory framework in the country, where mining is taking place	Law on mining (Official Gazette Federation of BiH, No. 26/2010) and secondary legislation (rule-notes, regulations, degrees etc.)
12	Impacts on water quality	
12.01	the potential effects of particle-laden plumes in the water column	Not applicable
12.02	increased total dissolved solids, trace metals, and other pollutants	
12.03	effects on underground waters and adjacent aquifers (chemical and physical changes)	None
12.04	acid mine drainage potential	None
12.05	drawdown or rising of groundwater levels	Not applicable
12.06	contamination of groundwater and surface water with chemicals and oil	Not
13	Impacts on air quality	
13.01	particulate matter transported by the wind as a result of transportation of materials	Manly no. Possible is particulate matter transported by a wind from nearby rock mine
13.02	gas emissions from the combustion of fuels in stationary and mobile sources	No
13.03	noise at surface	No
14	Impacts on fish and wildlife	
14.01	impacts of the mining operation on surrounding ecosystems (impacts to living organisms, removal or deterioration of adjacent habitats, disturbance of migration routes, disturbance of sediment which can create a sediment plume)	No
14.02	the toxic chemicals and fuel used in mining, their effects on ecosystems in the case if they are released by the mining process	Not applicable

14.03	impacts of suspended particles in water (impact on organisms, creation of additional sediment plumes or sediment release to adjacent surface aquifers, geochemical changes due to changes in redox conditions); abrasion effects on machinery (higher possibility of failure)	Impact on water of testing machine should give answer on this questions?
14.04	disruption of migration routes/nesting/breeding activities by presence of humans, light and noise from transportations and mining operations	None
14.05	potential local or regional loss of endemic or endangered species / creation of replacement habitats	None
14.06	impacts of underwater light, vibration	No
14.07	impacts of night time light emissions	No
15	Impacts on geology	
15.01	the potential for catastrophic slope failures	Not applicable
15.02	the destruction of unique geological features, fossils or minerals	None.
16	Impacts on social values	
16.01	impacts on livelihoods	Not applicable
16.02	impacts on public health (surface and groundwater contamination)	Not applicable. There are no studies of the water flux from the pit
16.03	increased traffic and truck trips (safety, noise, exhaust)	None
16.04	impacts of underwater light, vibration	None
16.05	vibration, tremors, fractures on buildings	None
17	Impacts of mining waste	
17.01	mining waste geotechnical stability	Stable
17.02	mining waste stable chemically	Stable
17.03	prevention of dusting	There are not dust in the area
17.04	Hazardous substances leakage or spillage – release of toxic ore, fuel and other hazardous material; oil or hydraulic fluid leaks from machinery	Those have to be controlled.
17.05	Fire and explosion (air emissions and runoff of contaminants)	None
17.06	Evaluation of possible impacts of natural hazards (earthquakes, severe weather...)	It is not possible occurrence any impacts of natural hazards
17.07	Accidents on transport routes (fuel, ore transportation etc.), pathways through protected areas	Do not expect
17.08	health status of workers	Not applicable
17.09	regular control of harmful materials and release from	None

	waste dumps (air, water particles, dissolution) at the site	
17.10	ensure systematic maintenance, service and testing of equipment and devices	It is possible with active industrial firms in Vareš (new mine private owner, BBM company and TRD – Factory of mechanic sections and tools production)
17.11	ensure protection against fire	It is possibility. Municipality and local fire work society
17.12	measurements of concentrations of harmful substances in the air at the site and ensure preventing of spreading them	None
17.13	personal safety equipment should be available	Yes. Safety gear must be used by workers in the site
17.14	safe access to the site, which should enable fast and safe evacuation routes	Yes. Main road to Vares is close of access road to open pit. Mine site have roads from two sides. There are safe evacuation routes.
17.15	restriction of movement in the mining area by unauthorised personnel and wild animals	We are going to implement it.
17.16	transport and access routes and loading areas should be dimension and arranged so that they ensure free-flowing and safe traffic	It is possible to be arranged
17.17	transport routes should be visibly marked	Needs to be arranged
17.18	workplaces should be organised in the way that workers are secured against bad weather conditions and falling objects; the workers should not be exposed to harmful noise and hazardous fumes, steam and dust	Needs to be prepared
17.19	ensure adequate equipment for evacuation and rescue, which should be allocated at accessible places and set for immediate use	Needs to be arranged
17.20	non-flammable, non-toxic and non-harmful use of hydraulic fluids	Needs to be arranged
17.21	plan for the mobilisation of rescue services and civil protection services in the case of major accidents	Needs to be arranged