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METODOLOŠKI PRISTUP IDENTIFIKACIJE ASPEKATA I VREDNOVANJA UTICAJA NA ŽIVOTNU SREDINU ZA PROJEKAT "EKSPLOATACIJA MAGNEZITA U LEŽIŠTU ČAVLOVAC-MASNICA"

Izvod

U ovom radu dat je metodološki pristup identifikacije aspekata i vrednovanja uticaja na životnu sredinu u cilju optimizacije modela procene rizika zagađenja životne sredine za projekte iz oblasti rudarstva u cilju poboljšanja i unapređenja tog procesa na primeru projekta "Eksploatacija magnezita u ležištu Čavlovac – Masnica" na području opštine Čajetina.

Ključne reči: *procena uticaja, identifikacija, vrednovanje, rizik zagađenja životne sredine.*

1. UVOD

Svaka društveno odgovorna organizacija pre otpočinjanja realizacije novog projekta neophodno je da pristupi preispitivanju zahteva koji se odnose na predmetni projekat i izvrši identifikaciju aspekata životne sredine i procenu rizika zagađenja životne sredine u cilju planiranja i projektovanja mera za izbegavanje, eliminisanje i/ili smanjenje rizika zagađenja životne sredine. Životna sredina je izvor prirodnih vrednosti i prirodnih resursa, a samim tim i izvor egzistencije pa se shodno tome moramo odgovorno odnositi prema toj činjenici. Kvalitet životne sredine zavisi od održivog upravljanja prirodnim vrednostima i prirodnim resursima. U odnosu na nivo industrijalizacije, urbanizacije i rasprostranjenosti korišćenja resursa, raste i potreba za održivim upravljanjem resursima. Jedan od instrumenata dostizanja tih ciljeva je i ***procena uticaja na životnu sredinu (Environmental Impact Assessment-EIA).*** Formalni postupak, koji danas nazivamo procenom uticaja na životnu sredinu, nastao je u razvijenim zapadnim zemljama kao rezultat narastanja svesti o potrebi zaštite životne sredine. Svrha procene uticaja na životnu sredinu je da se osigura razmatranje potencijalnih uticaja na životnu sredinu svih projekata

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kod kojih se očekuju značajni aspekti životne sredine. Poslednjih godina su praktično sve zemlje Sveta uvele u svoje zakonodavstvo obavezu procene uticaja na životnu sredinu. U osnovi, sistem procene uticaja na životnu sredinu podrazumeva koordiniranu saradnju Nosioca projekta (Investitora), vladinih organa, nevladinih organizacija, i zainteresovanih grupa na utvrđivanju potencijalnih uticaja određenog projekta na životnu sredinu na osnovu čega se njegova realizacija prihvata ili odbacuje. Obaveza procene uticaja na životnu sredinu u sistemu R. Srbije pokrenuta je donošenjem Zakona o proceni uticaja na životu sredinu *(Sl. glasnik RS br. 135/04 i 36/08)*, kao i niza podzakonskih akata, čime je u potpunosti usklađen sa procesom procene uticaja u razvijenim zemljama EU. Cilj procene uticaja na životnu sredinu je obezbeđivanje da projekti, planovi razvoja, programi, politika i dr., budu održivi i prihvatljivi sa stanovišta zaštite životne sredine. Prema tome, cilj procene uticaja na životnu sredinu je: identifikacija, opisivanje, vrednovanje i utvrđivanje, mogućih neposrednih i posrednih uticaja planiranog projekta na život i zdravlje ludi, floru i faunu, zemljiše, vode, vazduh, klimu, pejzaž, materijalna i kulturna dobra, uzajamno delovanje navedenih činilaca. U skladu sa time, osnovni motiv ovog rada je da se da doprinos razvoju optimalnog modela procene rizika zagađenja životne sredine za projekte iz oblasti rudarstva u cilju poboljšanja i unapređenja tog procesa procene uticaja na životnu sredinu na primeru projekta "Eksploatacija magnezita u ležištu Čavlovac – Masnica" na području opštine Čajetina.

2. KRATAK OPIS PROJEKTA ODNOSNO PREDMETA ISTRAŽIVANJA

2.1. Lokacija projekta

Istražni prostor "Čavlovac" i "Masnica" nalazi se sa leve i desne strane kanjona reke Ribnica na Zlatiboru. Kao što se zna Zlatibor pripada prostoru sa posebnim prirodnim vrednostima i prirodnim resursima. Prostor na kome su istražene i okonturene magnezitske zone počinje na severu od južnih padina Crnog vrha, na desnoj obali reke Ribnice, gde je izdvojena magnezitska zona Čavlovac, pa preko reke Ribnice, na jug do severnih padina brda Kriva Breza, gde su izdvojene magnezitske zone Masnice. Predmetna lokacija obuhvata područje magnezitnih ležišta Čavlovac i Masnica na Zlatiboru, odnosno istražni prostor broj 1432 sa granicama koje su date u sledećoj tabeli:

Tabela 1. *Koordinate istražnog prostora [2]*

Tačka/broj	X	Y	Topografska karta sa granicama eksploatacionog polja
1.	7.388.489	4.840.504	
2.	7.389.480	4.840.141	
3.	7.389.488	4.839.342	
4.	7.389.469	4.838.991	
5	7.387.763	4.839.093	
6	7.387.706	4.839.487	

2.2. Geološka građa ležišta „Čavlovac – Masnice“

Teren Zlatibora je izgrađen od pretežno harcburgitskih i lerzolitskih varijeteta peridotita, različitog stepena serpentinizacije. Duž pojedinih ruptura, različite veličine i geneze, formirana orudnjenja magnezita od kojih su samo tri magnezitonosne zone detaljno ispitivane. Na kartiranom terenu najveće rasprostranjenje imaju lerzolitski i harcburgitski varijeteti peridotita, podređeno verlita i dunita, odnosno enstatit dunita. Svi varijeteti peridotita su serpentinisani. Magnezitsko ležište na lokalitetu Čavlovac predstavljeno je jednom većom magnezitonosnom zonom, kao i brojnim apofiznim magnezitskim žicama [3]. Magnezitska zona je izgrađena od alterisanih, limonitisanih i delom silifikovanih peridotita, u kojima se javlja sistem skoro paralelnih magnezitskih žica. Pored magnezitskih žica debljine od 0,5-2,0 m javljaju se i manja sočivasta orudnjenja moćnosti od 2-8,0 m. Za magnezitske žice je karakteristično da se često razbijaju i spajaju kako po pružanju tako i po padanju. Uočeno je i prisustvo nekoliko apofiznih žica debljine od 0,5-3,0 m, koje se dijagonalno odvajaju od rudne zone.

2.3. Opis proizvodnog procesa i njegove glavne karakteristike

Tehnološka šema proizvodnog procesa dobijanja rude magnezita iz ležišta rudnika "Čavlovac i Masnica" na Zlatiboru [3] zasnovana je na sledećim fazama rada: *otvaranje i razrada ležišta → priprema za otkopavanje i otkopavanje rude → ventilacija rudnika → odvodnjavanje rudnika → jamski transport i izvoz rude iz jame → spoljni transport (odvoz) od jame doseparacije → rekultivacija degradirane površine terena.*

2.4. Predmet i područje delovanja predmetnog projekta

Utvrđivanje predmeta i područja delovanja projekta "Eksploatacija magnezita u ležištu Čavlovac - Masnica" u opštini Čajetina podrazumeva:

a) utvrđivanje osnovne delatnosti projekta koje uključuju:
   - redovne odnosno svakodnevne aktivnosti i
   - neredovne aktivnosti koje postoje ili se mogu javiti samo povremeno (vanredna situacija ili udes);
b) utvrđivanje fizičkih granica projekta;
c) utvrđivanje granica uticaja aktivnosti projekta;
d) utvrđivanje okruženja i analiza međusobnog uticaja;
e) utvrđivanje zakonske regulative koja se odnosi na konkretan projekat.

Eksploatacija mineralnih sirovina po strukturi i karakteru tehnološkog procesa direktno se realizuje u prirodnoj sredini degradirajući istu u užem ili širem prostoru i skoro se uvek očekuju značajni uticaji na životnu sredinu. Posledice degradacije se ogledaju u vidu privremenog ili trajnog karaktera. Mogući uticaji privremenog karaktera ogledaju se u kratkotrajnom: zagađenju vazduha, zagađenju voda, zagađenju zemljišta, i emisiji buke i vibracija. Moguće posledice trajnog karaktera su: degradacija zemljišta, promena režima kretanja površinskih i podzemnih voda, uništenje vodotokova, izmeštanje komunikacija i ljudskih naseobina i uništenje autohtonog vegetacionog pokrivača. Sve faze tehnološkog procesa otkopavanja rude magnezita na ležištu Čavlovac - Masnice odvijaju se u uslovima podzemne eksploatacije, za razliku od odvoza rude sa depoa, koji je lociran ispred ulaza u jamu i obavlja se spoljnim kamionskim transportom do separacije.

2.5. Identifikacija zainteresovanih organa, organizacija i javnosti za realizaciju projekta

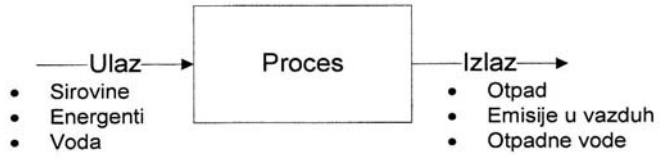
U postupku realizacije ovog projekta zainteresovana javnost su bila sva fizička ili pravna lica koja su imala interes u predmet projekta i planirane mere zaštite životne sredine koje se odnose na pred-

metni projekat. Zainteresovana javnost, odnosno strane u slučaju realizacije projekta bile su: Ministarstvo životne sredine, rudarstva i prostornog planiranja R. Srbije, Ministarstvo poljoprivrede i vodoprivrede R. Srbije, Nadležni organi i organizacije lokalne samouprave opštine Čajetina, meštani sela Jablanica, Investitori, lokalna i regionalna udruženja za zaštitu životne sredine; i druga zainteresovana javnost.

3. PRIMENJENI METODOLOŠKI PRISTUP IDENTIFIKACIJE ASPEKATA I VREDNOVANJA UTICAJA NA ŽIVOTNU SREDINU

3.1. Procesni pristup identifikacije aspekata životne sredine

Ono što je važno naglasiti je da se za identifikaciju aspekata životne sredine predlaže primena **procesnog pristupa**. Procesnim pristupom sagledavaju ju se svi elementi i aktivnosti tehnološkog procesa iz koga se sigurno očekuju ili se mogu očekivati negativni aspekti životne sredine predmetnog projekta. *Aspekat životne sredine - jeste element aktivnosti, proizvoda ili usluga koji može da bude u uzajamnom odnosu sa životnom sredinom* [7].



Sl. 1. *Model procesnog pristupa identifikacije aspekata životne sredine*

3.2. Izbor kriterijuma i metoda za vrednovanje uticaja aspekata životne sredine na životnu sredinu

Po izvršenom indetifikovanju aspekata životne sredine neophodno je da se definišu kriterijumi za vrednovanje značajnosti njihovog uticaja na životnu sredinu. Vrednovanje značajnosti aspekata životne sredine - jeste postupak utvrđivanja značajnosti aspekata životne sredine na osnovu verovatnoće njihovog pojavljivanja i očekivanih posledica po životnu sredinu. Utvrđivanje aspekata koji imaju značajan uticaj i za koje se moraju preduzeti odgovarajuće mere zaštite i mehanizami kontrole za njihovo smanjenje ili otklanjanje štetnih uticaja na životnu sredinu. Ovde treba imati na umu da je značajnost uticaja na životnu sredinu jedan relativan pojam koji sam po sebi ne može biti definisan u apsolutnim vrednostima. Izabrani metodološki pristup je omogućio prepoznavanje:

- negativnih (štetnih) uticaja na životnu sredinu od svih idetifikovanih aspekata proisteklih iz aktivnosti u realizaciji projekta;
- stvarne i potencijalne uticaje na životnu sredinu koji su rezultat aktivnosti projekta;

- osnovnih činilaca životne sredine koji mogu biti pod uticajem aspekata kao što su lokacija, vazduh, voda, zemljište, flora, fauna, kulturna baština itd.;
- moguće promene u životnoj sredini (vremenski period tokom kojeg se uticaj javlja, mogućost intenziteta jačine uticaja u tom vremenskom periodu).

Cilj indetifikovanja i vrednovanja uticaja aspekata životne sredine nesme umanjiti i promeniti zakonske obaveze Nosioca projekta. Za primenjene kriterijume postavljeni su nivoi (vrednosti) značajnosti. Vrste skala ili rangiranja su numeričke vrednosti što je od velike pomoći u dodeljivanju značajnosti recimo kvantitativno u smislu (1-najmanji, 4-najveći) ili opisno u smislu nivoa kao što su: visok, srednji, nizak, ili zanemarljiv.

U ovom slučaju primenjena je:
- metoda rangiranja značajnosti u odnosu na izračunavanje rizika (najjednostavniji matični metod procene rizika zagadjenja životne sredine);

Procena rizika zagađenja životne sredine svodi se na izračunavanje proizvoda dva faktora i to:
- faktora učestalosti (verovatnoća pojave aspekta);
- faktora ozbiljnosti pojave posledica po životnu sredinu, koje taj aspekt uzrokuje.

Tabela 2. *Faktor učestalosti*

Verovatnića pojave učestalosti aspekta životne sredine.....VU	**Ocena**
Očekuje se velika učestalost pojave aspekta životne sredine	4
Očekuje se srednja učestalost pojave aspekta životne sredine	3
Očekuje se mala učestalost pojave aspekta životne sredine	2
Očekuje se zanemarljiva pojava aspekta životne sredine	1

Tabela 3. *Faktor ozbiljnosti pojave posledica po životnu sredinu*

Ozbiljnost pojave posledica po životnu sredinu.....TP	**Ocena**
Očekuju se velike posledice i veoma veliki uticaj na kvalitet osnovnih činioca životne sredine	4
Očekuju se srednje posledice i veliki uticaj na kvalitet osnovnih činioca životne sredine	3
Očekuju se male posledice i mali uticaj na kvalitet osnovnih činioca životne sredine	2
Očekuju se zanemarljivo male posledice na kvalitet osnovnih činioca životne sredine	1

Rizik zagađenja životne sredine se izračunava kao proizvod verovatnoće pojave učestalosti određenog aspekta životne sredine i ozbiljnosti pojave posledica po kvalitet osnovnih činioca životne sredine (vazduh, voda, zemljište i dr.) i to:

$$R=VU \times TP$$

Tabela 4. *Gradacija rizika (R=VU x TP) [6]*

Rizik	Prioriteti koji se moraju primeniti u postupku kontrole procenjenog rizika
>9≤16	Identifikuje se potrebe za uspostavljanjem neprekidne kontrole zagađivanja životne sredine odnosno uspostavljanje stalnog monitoringa kvaliteta osnovnih činioca životne sredine.
>6≤9	Identifikuje se potrebe za uspostavljanjem periodične kontrole zagađivanja životne sredine odnosno vršenja periodičnog monitoringa kvaliteta osnovnih činioca životne sredine
>3≤6	Identifikuju se potrebe za uspostavljanjem povremene kontrole zagađivanja životne sredine odnosno vršenja povremenog monitoringa kvaliteta osnovnih činioca životne sredine
>1≤3	Ne identifikuju se potrebe za uspostavljanjem kontrole zagađivanja životne sredine niti preduzimanje posebnih mera zaštite, već samo rutinske mere zaštite životne sredine.

Iz izračunavanja verovatnoće učestalosti i težine posledica po kvalitet osnovnih činjenioca životne sredine može se utvrditi očekivani nivo rizika zagađenja životne sredine (tabela 5) koji se između ostalog mogu prikazati i u smislu semafora (zeleno-žuto-crveno).

Tabela 5. *Matrica procene ekološkog rizika [6]*

Verovatnoća učestalosti	Težina posledica			
	Zanemarljive	Male	Srednje	Velike
Zanemarljiva	1	2	3	4
Mala	2	4	6	8
Srednja	3	6	9	12
Velika	4	8	12	16

4. REZULTATI ISTRAŽIVANJA IDENTIFIKACIJE ASPEKATA I VREDNOVANJA UTICAJA NA ŽIVOTNU SREDINU

4.1. Procesni pristup identifikacije aspekata životne sredine

Za identifikaciju aspekata životne sredine korišćena je analiza aktivnosti tehnološkog procesa eksploatacije magnezita u ležištu "Čavlovac-Masnica" u opštini Čajetina.

Tabela 6. *Identifikacija aspekata i potencijalnih uticaja na životnu sredinu[6]*

Proces, aktivnost	Aspekt životne sredine	Stvarni ili potencijalni uticaj na životnu sredinu
Otvaranje i razrada ležišta magnezita	Izrada platoa ispred ulaza u jamu - podkop	Prodor jalovine u korito reke Ribnica od iskopa
		Emisija buke od rada rudarske mehanizacije
		Mogućnost spiranja sitnih čestica sedimentnih materija sa platoa i prodor u korito reke Ribnice
	Izrada glavne prostorije - podkopa, otvaranje i razrada ležišta	Nastajanje i odlaganje jalovine od iskopa (sterilna stena) na platou ispred ulaza u jamu
		Buka i vibracije od bušaško minerskih radova
	Rad rudarske mehanizacije na platou isped ulaza u jamu pri istovaru i utovaru rude magnezita	Emisija buke od rada rudarske mehanizacije pri istovaru i utovaru rude magnezita
		Mogućnost procurenja ulja i masti iz rudarske mehanizacije i zagađenja zemljišta na platou ispred jame
		Nastajanje komunalnog otpada pri izvođenju manipulativnih radova na platou ispred ulaza u jamu
	Izrada sanitarnog čvora za potrebe održavanja higi-jene radnika u neposrednoj blizini ulaska u jamu.	Nastajanje komunalnog otpada
		Zagađenja zemljišta od privremenog sanitarnog čvora
		Zagađenje voda od privremenog sanitarnog čvora
Priprema za otkopavanje i otkopavanje rude magnezita u ležištu	Izrada jamskih prostorija i iskop rude rudarskom mehanizacijom	Nastajanje jalovine od izrade jamskih prostorija
		Buka i vibracije od bušaško minerskih radova
		Mogućnost procurenja ulja i masti iz rudarske mehanizacije
		Emisija izduvnih gasova od rada rudarske mehanizacije
	Priprema i izvođenje minerskih radova pri iskopu rude u jami	Moguća nekontrolisana eksplozija minsko eksplozivnih sredstava usled neprop. skladišt. i/ili rada sa eksplozivima
Ventilacija jame	Rad ventilatora u ventilacionom podkopu (oknu) za provetravanje jame	Emisija buke u radnoj i životnoj sredini
		Izbacivanje izduvnih gasova rudarske mehanizacije i gasova od miniranja pri izradi jamskih prostorija
Odvodnjavanje iz jame	Drenaža voda koje dospevaju do jamskih prostorija i izlaze potkopom na površinu	Moguće zagađenje reke Ribnice zagađenim vodama usled koje izlaze iz jamskih prostorija.
Jamski transport i izvoz rude magnezita iz jame	Utovar iskopane rude u sredstva za transport, jamski transport i istovar rude magnezita na platou ispred ulaska u jamu	Mogućnost procurenja dizel goriva, ulja i masti iz rudarske mehanizacije za jamski transport rude magnezita
		Emisija izduvnih gasova od rada rudarske mehanizacije pri utovaru, transportu i istovaru rude magnezita
	Procerenje dizel goriva, ulja ili masti iz rudarske mehanizacije koje može dospeti u jamske otpadne vode	Potencijalni udes i zagađenje voda koje podkopom izlaze iz jame, a dalje u reku Ribnicu
Odvoženje rude na dalju preradu	Utovar rude u kamion rudarskom mehanizacijom sa pogonom na dizel gorivo	Emisija buke od rada kamiona i utovarivača
		Emisija prašine od pretovara rude
		Mogućnost proc. dizel goriva, ulja i maziva iz utovarivača
Korišćenje / Skladištenje / i naftnih derivata	Privremeno uskladištenje i povremeno pretakanje nafnih derivata u rudarsku mehanizaciju	Zagađenje zemljišta naftom, uljima i mazivima
		Spiranje zagađenog zemljišta atmosferskim vodama i prodor i zagađenje reke Ribnice
		Nastanak požara pri pretakanju naftnih derivata
Koriš. / Skladištenje /minskoeksplozivnih sredstava	Dopremanje eksploziva do jamskog radilišta, i izvođenje minerskih operacija	Mog. nastanka nekotro. eksplozija, požara i povreda ljudi
		Oštećenje ili pak rušenje objekata u neposrednoj blizini
		Oštećenje rudarske mehanizacije
Ruda magnezita	Svojstva i karakteristike magnezita prema osnovnim činiocima životne sredine	Pozitivno delovanje na oplemenjivanju ili unapređenju kvaliteta voda

4.2. Princip vrednovanja stvarnih i potencijalnih uticaja na životnu sredinu

Tabela 7. *Vrednovanje stvarnih i potencijalnih uticaja na životnu sredinu [6]*

Proces, aktivnost: **OTVARANJE I RAZRADA LEŽIŠTA MAGNEZITA ČAVLOVAC - MASNICA**			
Stvarni ili potencijalni uticaj na životnu sredinu	**Kriterijumi za vrednovanje uticaja na živ. sredinu**		
	VU	**TP**	**R**
Prodor jalovine u korito reke Ribnice od iskopa koji se vrši za ulazak u jamu	2	4	8
Emisija buke od rada rudarske mehanizacije pri izradi platoa	2	2	4
Mogućnost spiranja sitnih čestica sedimentnih materija sa platoa i zatrpavanje korita reke Ribnice	3	3	9
Nastajanje i odlaganje jalovine od iskopa (sterilna stena) na platou ulaza u jamu	2	2	4
Buka i vibracije od bušaško minerskih radova pri izradi podkopa.	2	2	4
Emisija buke od rada rudarske mehanizacije pri istovaru i utovaru rude magnezita	2	2	4
Mogućnost procurenja ulja i masti iz rudarske mehanizacije i zagađenja zemljišta na platou ispred jame	3	3	6
Nastajanje komunalnog otpada pri izvođenju manipulativnih radova na platou ispred ulaza u jamu	2	2	4
Nastajanje komunalnog otpada	2	2	4
Zagađenja zemljišta od privremenog sanitarnog čvora	2	3	6
Zagađenje voda od privremenog sanitarnog čvora	2	3	6

Tabela 8. *Vrednovanje stvarnih i potencijalnih uticaja na životnu sredinu [6]*

Proces, aktivnost: **PRIPREMA ZA OTKOPAVANJE I OTKOPAVANJE RUDE MAGNEZITA**			
Stvarni ili potencijalni uticaj na životnu sredinu	**Kriterijumi za vrednovanje uticaja na živ. sredinu**		
	VU	**TP**	**R**
Nastajanje jalovine od izrade jamskih prostorija	4	2	8
Buka i vibracije od bušaško minerskih radova pri iskopu rude u jami	4	1	4
Mogućnost procurenja ulja i masti iz rudarske mehanizacije pri iskopu rude	3	3	9
Emisija izduvnih gasova od rada rudarske mehaniz. pri iskopu rude	4	1	4
Moguća nekontrolisana eksplozija minsko eksplozivnih sredstava usled nepropisnog skladištenja i/ili rada sa istima - Potencijalni udes	/	/	>6≤12

Tabela 9. *Vrednovanje stvarnih i potencijalnih uticaja na životnu sredinu [6]*

Proces, aktivnost: VENTILACIJA JAME			
Stvarni ili potencijalni uticaj na životnu sredinu	**Kriterijumi za vrednovanje uticaja na živ. sredinu**		
	VU	**TP**	**R**
Emisija buke u radnoj i životnoj sredini	3	1	3
Izbacivanje izduvnih gasova rudarske mehanizacije i gasova od miniranja pri izradi jamskih prostorija	3	1	3

Tabela 10. *Vrednovanje stvarnih i potencijalnih uticaja na životnu sredinu [6]*

Proces, aktivnost: **ODVODNJAVANJE IZ JAME**			
Stvarni ili potencijalni uticaj na životnu sredinu	**Kriterijumi za vrednovanje uticaja na živ. sredinu**		
	VU	**TP**	**R**
Moguće zagađenje reke Ribnice vodama koje izlaze iz jamskih prostorija zagađenim usled rada rudarske mehanizacije.	3	3	9

Tabela 11. *Vrednovanje stvarnih i potencijalnih uticaja na životnu sredinu [6]*

Proces, aktivnost: **JAMSKI TRANSPORT I IZVOZ RUDE MAGNEZITA**			
Stvarni ili potencijalni uticaj na životnu sredinu	**Kriterijumi za vrednovanje uticaja na živ. sredinu**		
	VU	**TP**	**R**
Mogućnost procurenja dizel goriva, ulja i masti iz rudarske mehanizacije za jamski transport rude magnezita	3	3	9
Emisija izduvnih gasova od rada rudarske mehanizacije pri utovaru, transportu i istovaru rude magnezita	4	1	4
Potencijalni udes i zagađenje voda koje izlaze iz jame, a dalje idu u reku Ribnicu	/	/	>6≤12

Tabela 12. *Vrednovanje stvarnih i potencijalnih uticaja na životnu sredinu*

Proces, aktivnost: **SPOLJNI TRANSPORT RUDE DO SEPARACIJE**			
Stvarni ili potencijalni uticaj na životnu sredinu	**Kriterijumi za vrednovanje uticaja na živ. sredinu**		
	VU	**TP**	**R**
Emisija buke od rada kamiona i utovarivača	3	1	3
Emisija prašine od pretovara rude	3	1	3
Mogućnost procurenja dizel goriva, ulja i maziva iz kamiona i utovarivača	3	3	9

Tabela 13. *Vrednovanje identifikovanih aspekata životne sredine [6]*

Proces, aktivnost: KORIŠĆENJE I PRIVREMENO SKLADIŠTENJE I NAFTNIH DERIVATA			
Stvarni ili potencijalni uticaj na životnu sredinu	**Kriterijumi za vrednovanje uticaja na živ. sredinu**		
	VU	**TP**	**R**
Zagađenje zemljišta naftom, uljima i mazivima	3	3	9
Spiranje zagađenog zemljišta atmosfersk. vodama, prodor i zagađenje reke Ribnice	3	3	9
Nastanak požara pri pretakanju naftnih derivata	3	3	9

Tabela 14. *Vrednovanje stvarnih i potencijalnih uticaja na životnu sredinu [6]*

Proces, aktivnost: **KORIŠĆENJE I SKLADIŠTENJE MINSKO-EKSPLOZIVNIH SREDSTAVA**			
Stvarni ili potencijalni uticaj na životnu sredinu	**Kriterijumi za vrednovanje uticaja na živ. sredinu**		
	VU	**TP**	**R**
Mogućnost nastanka nekotrolisanih eksplozija, požara i povreda ljudi	3	3	9
Oštećenje ili pak rušenje objekata u neposrednoj blizini	3	3	9
Oštećenje rudarske mehanizacije	3	3	9

NAPOMENA: *Stvarni ili potencijalni uticaj na životnu sredinu gde može nastati UDES ili VANREDNA SITUACIJA se ne vrednuje već se automatski tretira kao ZNAČAJAN ASPEKT ŽIVOTNE SREDINE, za koji je potrebno planirati odgovarajuće mere zaštite.*

4.3. Registar značajnih aspekata životne sredine sa predlogom mera zaštite životne sredine

Nakon izvršene identifikacije i vrednovanja uticaja aspekata na životnu sredinu utvrđen je registar značajnih aspekata za koje je potrebno primeniti mere za eliminisanje, smanjenje rizika i uspostavljanje kontrole nad procenjenim rizicima zagađenja životne sredine.

Tabela 15. *Registar značajnih aspekata životne sredine [6]*

R. br.	**Registrovani značani aspekti životne sredine**	**Rizik**	**Mere zaštite životne sredine koje treba preduzeti**				
			Tehno-loške	**Tehničke**	**Organi-zacione**	**Sanitarno higijenske**	**Administra-tivne**
1.	Prodor jalovine u korito reke Ribnica od iskopa koji se vrši za ulazak u jamu	8	✓	✓	✓	/	✓
2.	Mogućnost spiranja sedimentnih materija sa platoa i zamućenje reke Ribnice	9	✓	✓	✓	/	✓
3.	Nastajanje i odlaganje jalovine od iskopa (sterilna stena) na platou ispred ulaza u jamu	6	✓	✓	✓	/	/
4.	Mogućnost procurenja ulja i masti iz rudarske mehanizacije i zagađe-nja zemljišta na platou ispred jame	9	✓	✓	✓	/	/
5.	Nastajanje komunalnog otpada pri izvođenju manipulativnih radova na platou ispred ulaza u jamu	6	/	/	✓	✓	✓
6.	Nastajanje komunalnog otpada	9	/	/	✓	✓	✓
7.	Zagađenja zemljišta od privremenog sanitarnog čvora	9	/	✓	✓	✓	✓
8.	Zagađenje voda od privremenog sanitarnog čvora	9	/	✓	✓	✓	✓
9.	Nastajanje jalovine od izrade jamskih prostorija	8	✓	✓	/	/	/
10.	Mogućnost procurenja ulja i masti iz rudarske mehan. pri iskopu rude	9	/	/	✓	/	/

11.	Moguće zagađenje reke Ribnice vodama zagađenim usled rada rudarske mehanizacije koje izlaze iz jamskih prostorija	9	✓	✓	✓	/	/
12.	Mogućnost procurenja dizel goriva, ulja i masti iz rudarske mehanizacije za jamski transport rude magnezita	9	/	/	✓	/	/
13.	Mogućnost procurenja dizel goriva, ulja i maziva iz kamiona i utovarivača	9	/	/	✓	/	/
14.	Zagađenje zemljišta naftom, uljima i mazivima	9	/	/	✓	/	/
15.	Spiranje zagađenog zemljišta atmosferskim vodama i prodor i zagađenje reke Ribnice	9	✓	/	✓	/	/
16.	Nastanak požara pri pretakanju naftnih derivata	9	/	/	✓	/	/
17.	Mogućnost nastanka nekotrolisanih eksplozija, požara i povreda ljudi	9	/	✓	✓	/	/
18.	Oštećenje ili pak rušenje objekata u neposr. blizini od nek. eksplozija	9	/	✓	✓	/	/
19.	Oštećenje rudarske mehanizacije od nekontrolisanih eksplozija	9	/	✓	✓	/	/

6. ZAKLJUČAK

Politika zaštite životne sredine u realizaciji određenog projekta treba da se zasniva na poznavanju aspekata životne sredine i značajnih uticaja na životnu sredinu koje konkretni projekat uzrokuje.

Na osnovu prethodnih iskustava i kao i na osnovu ovih istraživanja može se zaključiti da je u ovom radu prikazani metodološki pristup identifikacije aspekata i vrednovanja uticaja na životnu sredinu projekta "EKSPLOATACIJA MAGNEZITA U LEŽIŠTU ČAVLOVAC – MASNICE" dao optimalne rezultate procene nivoa rizika zagađenja životne sredine i dobio još jednu potvrdu podobnosti za dalju primenu u istim ili sličnim projektima i da će biti od značajne koristi za dalji razvoj optimizacije ovog metodološkog postupka. Na osnovu napred navedenih rezultata propisane su odgovoarajuće mere zaštite životne sredine koje su prikazane u okviru Studija procene uticaja na životnu sredinu za projekat "EKSPLOATACIJA MAGNEZITA U LEŽIŠTU ČAVLOVAC - MASNICE".

Predmetna studija je bila predmet javnog uvida i javne rasprave. Nakon završene procedure izdata je i odgovarajuća saglasnost na studiju procene uticaja što se može uzeti u obzir kao potvrda podobnosti primenjenog metodolškog pristupa.

LITERATURA

[1] Situaciona karta rudnika „Ribnica“ u razmeri 1:1000 sa ucrtanim granicama eksploatacionog polja;

[2] Topografska karta užeg područja Zlatibora sa ucrtanim eksploatacionim poljem rudnika Ribnica;

[3] Studija izvodljivosti eksploatacije magnezita iz ležišta "Ribnica" - Zlatibor, urađenu oktobra 2010 godine od strane preduzeća "RdS grupa" iz Bora;

[4] Rešenje Ministarstva nauke i zaštite životne sredine kojim se određuje obim i sadržaj Studije o proceni uticaja eksploatacije magnezita u ležištu "Ribnica" - lokaliteti Čavlovac i Masnice u selu Jablanica, opština Čajetina na životnu sredinu, broj 353-02-487/2005-02 od 29.11.2005;

[5] Staletović N., Razvojno planiranje zaštite životne sredine - put ka održivom razvoju, QWERTY, Bor, 2006.

[6] Staletović N., Nenadić D; Studija procene uticaja na životnu sredinu za projekat "EKSPLOATACIJA MAGNEZITA U LEŽIŠTU ČAVLOVAC - MASNICE ", OPŠTINA ČAJETINA; RdS Bor, 2011

[7] SRPS ISO 14001, (2005), Sistem upravljanja zaštitom životne sredine - Opšte smernice za principe, sisteme i postupke, Institut za standardizaciju Srbije, Beograd

[8] SRPS ISO 14004, (2004), Sistem upravljanja zaštitom životne sredine - Opšte smernice za principe, sisteme i postupke, Institut za standardizaciju Srbije, Beograd

[9] S. Kovačević, N. Staletović, N. Tucović, R. Janković; Kvantitativna procena rizika u funkciji manadžmenta integrisanim sistemima, 14. DQM Međunarodna konferencija Upravljanje kvalitetom i pouzdanošću ICDQM – 2011, (ISBN 978-86-86355-05-8, pp.159-165), 29-30. Jun 2011.godine. Beograd, Srbija.

[10] The World Bank Operational Manual Environmental Assessment; OP 4.01; January 1999

[11] Zakon o zaštiti životne sredine „Službeni glasnik RS", br. 135/04 i 36/2009

[12] Zakon o proceni uticaja na životnu sredinu „Službeni glasnik RS", br. 135/04 i 36/2009

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METHODOLOGICAL APPROACH TO THE IDENTIFICATION AND ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROJECT" MAGNESITE MINING IN THE DEPOSIT ČAVLOVAC-MASNICA"

Abstract

This work presents a methodological approach to the identification of aspects and evaluation the environmental impact, in order to optimize the model of risk assessment of environmental pollution for the mining projects, in order to improve and advance this process on the example of the project "Magnesite Mining in the Deposit Čavlovac - Masnica" in the area of the municipality Čajetina.

Keywords: *impact assessment, identification, evaluation, risk of environmental pollution*

1. INTRODUCTION

It is necessary that every socially responsible organization, before beginning the implementation of a new project, to approach the review of requirements related to the subject project and identifies the environmental aspects and risk assessment of environmental pollution in order to plan and design measures to prevent, eliminate and/or reduce the risk of environment pollution. Environment is a source of natural values and natural resources, and thus a source of existence, and therefore we have to deal responsibly with that fact. Quality of the environment depends on sustainable management of natural values and natural resources. In relation to the level of industrialization, urbanization and spread of the use of resources, the need for sustainable management of resources also increases. One of the instruments to achieve these goals is the **environmental impact assessment** (EIA). Formal procedure, now known as the environmental impact assessment, originated in developed countries as the result of growing awareness of the need for environmental protection.

The purpose of environmental impact assessment is to ensure a consideration of potential environmental impact of all projects which are expected to significant environmental aspects. In recent years,

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virtually all countries of the world have introduced into their legislation the obligation of assessment the environmental impact. Basically, the system of environment impact assessment involves a coordinated cooperation of the Project Holder (Investor), governmental bodies, NGOs, and interested groups to identify the potential impacts of a certain project on the environment, based on which the implementation of the same is accepted or rejected. The obligation of environmental impact assessment in the system of the Republic of Serbia was launched by the enactment of the Law on Environmental Impact Assessment on the life environment (*Official Gazette RS, Nos. 135/04 and 36/08*), and a number of by-laws, which is in a full compliance in line with the process of impact assessment in developed countries of the EU. The aim of environment impact assessment is to ensure that the projects, development plans, programs, policies, and others are sustainable and acceptable from the point of view of environmental protection. Therefore, the aim of environmental impact assessment is: identification, description, evaluation and identification the potential direct and indirect impacts of the planned project on the life and health of people, flora and fauna, soil, water, air, climate, landscape, material and cultural goods, the interaction of given factors. Accordingly, the main motive of this work is to contribute to the development of an optimum model of risk assessment the environmental pollution for mining projects, in order to improve and advance this process of environmental impact assessment on the example of the project "Magnesite Mining in the Deposit Čavlovac - Masnica" in the area of the municipality Čajetina.

2. BRIEF DESCRIPTION OF THE PROJECT OR THE CASE STUDY

2.1. Location of the Project

The exploration area "Čavlovac" and "Masnica" is located on the left and right side of the river Ribnica canyon on Zlatibor. As it is known, Zlatibor belongs to the area with special natural values and natural resources. The area, in which the magnesite zones were explored and contoured, begins in the north from the southern slopes of Crni vrh, on the right bank of the river Ribnica, where the magnesite zone Čavlovac is separated, and over the river Ribnica, to the south to the northern slopes of the hill Kriva Breza, where the magnesite zones are separated. The subject site comprises the area of magnesite deposit Čavlovac and Masnica on Zlatibor, i.e. the exploration area No. 1432 with the limits given in the following Table:

Table 1 *Coordinates of exploratory area [2]*

Point/No.	X	Y	Topographic map with borders of exploitation field
1.	7.388.489	4.840.504	
2.	7.389.480	4.840.141	
3.	7.389.488	4.839.342	
4.	7.389.469	4.838.991	
5	7.387.763	4.839.093	
6	7.387.706	4.839.487	

2.2. Geological structure of deposit "Čavlovac – Masnica"

The Zlatibor field is built mainly of harzburgitic and lherzolitic peridotite varieties, of different degree of serpentinization. Magnesite mineralizations were formed along the certain ruptures of different size and genesis, out of which only three are magnesite-bearing zones, investigated in detail.

On the mapped terrain, the harzburgitic and lherzolitic peridotite varieties have the largest extend, subordinated to verlite and dunite or enstatite dunite. All varieties of peridodite are serpentinized. The magnesite deposit Čavlovac deposit is represented by a large magnesite-bearing zone, as well as numerous apophysis veins[3].

Magnesite zone was constructed from altered, limonited and partly silicifed peridotite, in which almost parallel system of magnesite veins occurs. Besides the magnesite veins, thickness of 0.5 to 2.0 m, there are smaller lenticular mineralization, thickness of 2 to 8.0 m. Magnesite veins are characteristic in a fact that they are often broken and connected both on expanding and falling. The presence of several apophysis veins, thickness of 0.5 to 3.0 m, was observed, which are diagonally separated from the ore zone.

2.3. Description the production process and its main characteristics

Technological scheme of the production process for mining the magnesite ore from the mine deposit "Čavlovac and Masnica" on Zlatibor [3] is based on the following phases of operation: *opening and development of deposit → preparation for mining and ore mining → mine ventilation → mine drainage → underground pit ore transportation and haulage → external transportation from the pit to the separation → reclamation of degraded terrain surfaces.*

2.4. Subject and area of the project activity

Identification the subject and area of the project "Mining of magnesite in the deposit "Čavlovac-Masnica" in the municipality Čajetina includes:

a) Determining the main activities of the project, including:
- Regular or daily activities, and
- Irregular activities that exist or may occur only occasionally (emergency or accident);

b) Determining the physical boundaries of the project;
c) Determining the limits of the impact of the project activities;
d) Determining the environment and analysis of mutual effect;
e) Determining the regulations pertaining to the specific project.

Mining of mineral resources by the structure and character of the technological process is implemented directly in the natural environment degrading the same in narrower or wider area and almost always the significant impacts on the environment are expected. Consequences of degradation are reflected in the form of a temporary or permanent character. Possible temporary impacts are reflected in a short-term: air pollution, water pollution, soil pollution, and noise and vibration emission.

Possible consequences of a permanent character are: land degradation, changing the regime of movement the surface water and groundwater, watercourses destruction, displacement of communications and human settlements and destruction of autochthonous vegetation cover. All stages of the technological process of magnesite ore mining in the deposit Čavlovac - Masnica take place in the conditions of underground mining, as opposed to the ore transport from a depot, which is located at the entrance to the pit, and it is performed by external trucks to the separation.

2.5. Identification the interested bodies, organizations and t public for the project implementation

In the process of this project implementation, the interested public was all physical or legal entities who have an interest in the subject of the project and planned environmental protection measures relating to the subject project. The interested public, or in the case of the project implementation, were: The Ministry of Environment, Mining and Spatial Planning of the Republic of Serbia, the Ministry of Agriculture and Water Management of the Republic of Serbia, authorities and local government organizations of the municipality Čajetina, residents of the village of Jablanica, investors, local and regional associations for the environmental protection, and other interested public.

3. THE APPLIED METHODOLOGICAL APPROACH OF IDENTIFICATION THE ASPECTS AND EVALUATION TO THE ENVIRONMENTAL IMPACT

3.1. Process approach to the identification the environmental aspects

The important is to identify the environmental aspects, suggested by the use of a process approach. Process approach perceives all elements and activities of the technological process of which it is certainly expected or could be expected the negative environmental aspects of the subject project. *Aspect of the environment is an element of activities, products or services that may be in the mutual relationship with the environment* [7].

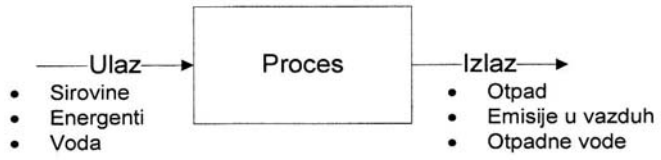

Fig. 1. *Model of process approach of identification the environmental aspects*

3.2. Selection the criteria and methods for evaluation the impact of environmental aspects on the environment

Upon performed identification the aspects of the environment, it is necessary to define the criteria for evaluation the significance of their impact on the environment. Evaluation the significance of environmental aspects is the process of determining the significance of environmental aspects on the basis of their probability of occurrence and expected effects on the environment. Determining the aspects that have a significant impact and for which the appropriate measures have to be taken as well as the control mechanisms for their reduction or elimination the harmful impacts on the environment. It should be borne in mind that the significance of the environmental impact is a relative term that itself cannot be defined in the absolute values. The selected methodological approach has enabled the identification of:

- Negative (adverse) impact on the environment of all identified aspects arising from the activities of the project implementation;

- Actual and potential impacts on the environment resulting from the project activities;
- Basic environmental factors that can be influenced by the aspects such as location, air, water, soil, flora, fauna, cultural heritage, etc.;
- Possible changes in the environment (the time period during which the impact occurs, possibility of measuring the intensity of the impact in that time).

The aim of identification and evaluation the impact of environmental aspects must not diminish and change the legal obligations of the Project holder. The levels (values) of significance are set for the applied criteria. Types of scales or ranking are the numerical values which are of great help in assigning the significance, for example in terms of quantity (1-minimum, 4-maximum) or a descriptive level in terms such as: high, medium, low or negligible.

In this case, the following is applied:

- Method of ranking the significance in relation to the calculation of risk (the simplest matrix method for the risk assessment for environmental pollution);

The risk assessment of environmental pollution is reduced to the calculation of product of two factors, as follows:

- Frequency factor (probability of aspect occurrence);
- Factor of seriousness of environmental consequences, which that aspect has caused.

Table 2. *Frequency factor*

Probability of occurrence the frequency of environmental aspects .....VU	**Rating**
High frequency of occurrence the environmental aspects is expected	4
Medium frequency of occurrence the environmental aspects is expected	3
Low frequency of occurrence the environmental aspects is expected	2
Negligible frequency of occurrence the environmental aspects is expected	1

Table 3. *Seriousness factor of impacts on the environment*

Seriousness of impacts on the environment…….TP	**Rating**
High impacts and very big effect on the quality of basic environmental factors are expected	4
Medium impacts and very big effect on the quality of basic environmental factors are expected	3
Low impacts and very big effect on the quality of basic environmental factors are expected	2
Negligible impacts and very big effect on the quality of basic environmental factors are expected	1

Risk of environmental pollution is calculated as the product of the probability of occurrence the frequency of a particular aspect of the environment and the seriousness of consequences for the quality of primary environmental factors (air, water, land, etc.) as follows:

$$R=VU \times TP$$

Table 4. *Gradation of risks (R=VU x TP) [6]*

Risk	Priorities to be applied in the procedure of control the assessed risk
>9≤16	The needs are identified to establish the permanent control of environmental pollution or establishment the permanent monitoring of the quality of basic environmental factors
>6≤9	The needs are identified to establish the periodical control of environmental pollution or carrying out the periodical monitoring of the quality of basic environmental factors
>3≤6	The needs are identified to establish the occasional control of environmental pollution or carrying out the occasional monitoring of the quality of basic environmental factors
>1≤3	Ne identifikuju se potrebe za uspostavljanjem kontrole zagađivanja životne sredine niti preduzimanje posebnih mera zaštite, već samo rutinske mere zaštite životne sredine. The needs are not identified to establish the control of environmental pollution nor carrying taking the special measures of protection, but only the routine measures of environmental protection measures

From calculating the probability of frequency and severity of consequences for the quality of basic factors of environment, the expected level of environmental risk can be determined (Table 5), which among other things can be shown in terms of the traffic light (green-yellow-red).

Table 5. *Matrix of assessment the environmental risk [6]*

Probability of frequency	Weight of consequences			
	Negligible	Low	Medium	High
Negligible	1	2	3	4
Low	2	4	6	8
Medium	3	6	9	12
High	4	8	12	16

4. RESULTS OF INVESTIGATION THE IDENTIFICATION OF ASPECTS AND EVALUATION THE ENVIRONMENTAL IMPACT

4.1. Process approach to the identification of environmental aspects

For identification the environmental aspects, it was used the analysis of activities of the technological process of mining the magnesite deposit "Čavlovac-Masnica" in the municipality Čajetina.

Table 6. *Identification the aspects and potential impact of the environment [6]*

Process, activity	Environmental aspect	Real or potential impact on the environment
Opening and development the deposit of magnesite	Making the plateau in front of the pit - drift	Penetration of waste in the river bed of Ribnica
		Noise emissions from the operation of mining machines
		Possibility of leaching the fine particles of sediment material from the plateau and penetration into the river bed of Ribnica
	Development of the main room - drift, opening and development of deposit	Formation and disposal of overburden of excavation (sterile rocks) in front of the entrance to the pit
		Noise and vibration from drilling and blasting
	Operation of mining equipment on the plateau in front of the entrance to the pit in the loading and unloading of magnesite ore	Noise emissions from the operation of mining machines in the loading and unloading of magnesite ore
		The possibility of leakage from oil and grease from mining machinery and land pollution in front of the pit
		Municipal waste in the execution of manipulative work in front of the entrance to the pit
	Making sanitary facilities for hygiene maintenance of workers near the entrance to the pit.	Municipal waste
		Soil contamination from temporary sanitary facilities
		Water pollution from temporary sanitary facilities
Preparing for mining and excavation the magnesite ore in the deposit	Making underground rooms and excavation ore by mining machinery	The formation of slag from making parts of the mine
		Noise and vibration from blasting – drilling operations
		The possibility of leakage from oil and grease from the mining equipment
		Exhaust emissions from the operation of mining machines
	Preparation and execution of blasting works during excavation of ore in the pit	Chance of uncontrolled explosions of blasting agents due to improper storage and / or work with explosives
Pit ventilation	Fan operation in the ventilation drift for pit ventilation	Noise emission in living and working environments
		Wheel emissions of mining mechanization of mining and gas development in parts of the mine
Pit dewatering	Drainage of water in the pit rooms and out to the surface by drift	Possible contamination of the river Ribnica polluted water due to coming out of parts of the mine.
Pit transport and haulage of magnesite ore from the pit	Loading of mined ore in the means of transport, pit transport and unloading of magnesite ore on a plateau in front of the entrance to the pit	The possibility of leakage of diesel fuel, oil and grease pit mining equipment for the transport of magnesite ore
		Exhaust emissions from the operation of mining machines for loading, transporting and unloading of magnesite ore
	Leakage of diesel fuel, oil or grease from mining machinery that can reach the underground wastewater	Potential accidents and contamination of water out of the pit, and further into the river Ribnica
Ore transport for further processing	Loading of ore using the mining machinery in the truck driven by diesel fuel	The emission of noise from the trucks and loaders
		Dust emissions from the loading of ore
		Able to go. diesel fuel, oil and lubricants from the loader
Use/ storage / iol derivatives	Temporary storage and periodical transferring the petroleum products in the mining machinery	Soil pollution by oil, oil and lubricants
		Runoff of contaminated soil and atmospheric water penetration and pollution of the river Ribnica
		Occurrence of fire from loading petroleum products
Use/ storage / blasting agents	Delivery of explosives to the pit site, and carrying out the blasting operations	Possibility of occurrence the explosions, fires and injuries of people
		Damage or destruction of buildings in the immediate vicinity of
		Damage to mining equipment
Magnesite ore	Properties and characteristics of magnesia according to the basic environmental factors	Positive effect on the breeding and improvement of water quality

4.2. The principle of evaluation the actual and potential impacts on the environment

Table 7. *Evaluation the actual and potential impacts on the environment [6]*

PROCESS, ACTIVITY: OPENING AND DEVELOPMENT THE MAGNESITE DEPOSIT ČAVLOVAC – MASNICA			
Actual and potential impacts on the environment	**Criteria for evaluation the environmental impact**		
	VU	**TP**	**R**
Penetration of waste in the river bed Ribnice of excavation in front to the entrance in the pit	2	4	8
Noise emissions from the operation of mining machines in the preparation of the plateau	2	2	4
Possibility of leaching the fine particles of sediment material from the plateau and backfilling the riverbed of Ribnica	3	3	9
The formation and disposal of overburden excavation (sterile rocks) on the plateau of the entrance to the cave	2	2	4
Noise and vibration from blasting-drilling in making the drift	2	2	4
Noise emissions from the operation of mining machines in the loading and unloading of magnesite ore	2	2	4
The possibility of leakage from oil and grease from mining machinery and land pollution in front of the pit	3	3	6
Municipal waste in the execution of manipulative work in front of the entrance to the pit	2	2	4
Municipal waste	2	2	4
Soil contamination from temporary sanitary facilities	2	3	6
Water pollution from temporary sanitary facilities	2	3	6

Table 8. *Evaluation the actual and potential impacts on the environment [6]*

PROCESS, ACTIVITY: PREPARATION FOR MINING AND EXCAVATION THE MAGNESITE ORE			
Actual and potential impacts on the environment	**Criteria for evaluation the environmental impact**		
	VU	**TP**	**R**
The formation of waste from making the mining facilities	4	2	8
Noise and vibration from blasting- drilling works in the excavation of ore in the pit	4	1	4
The possibility of leakage from oil and grease from the mining equipment at mining excavation	3	3	9
Exhaust emissions from the mining operation machinery in the excavation of ore	4	1	4
Chance of uncontrolled explosions of blasting agents due to improper storage and / or work with the same - Potential accident	/	/	>6≤12

Table 9. *Evaluation the actual and potential impacts on the environment [6]*

Process, activity: PIT VENTILATION			
Actual and potential impacts on the environment	**Criteria for evaluation the environmental impact**		
	VU	**TP**	**R**
Noise emission in living and working environments	3	1	3
Exhaust emissions from the mining operation machinery in the excavation of ore	3	1	3

Table 10. *Evaluation the actual and potential impacts on the environment [6]*

Process, activity: PIT DEWATERING			
Actual and potential impacts on the environment	**Criteria for evaluation the environmental impact**		
	VU	**TP**	**R**
Possible contamination of the river Ribnica by water coming out of parts of the mine polluted by the operation of mining machinery	3	3	9

Table 11. *Evaluation the actual and potential impacts on the environment [6]*

Process, activity: PIT TRANSPORT AND HAULAGE OF MAGNESITE ORE			
Actual and potential impacts on the environment	**Criteria for evaluation the environmental impact**		
	VU	**TP**	**R**
Possibility of leakage of diesel fuel, oil and grease from the mining equipment for the pit transport of magnesite ore	3	3	9
Exhaust emissions from the operation of mining machines for loading, transporting and unloading of magnesite ore	4	1	4
Potential accidents and contamination of water coming out of the pit, and go away into the river Ribnica	/	/	>6≤12

Table 12. *Evaluation the actual and potential impacts on the environment*

Process, activity: EXTERNAL TRANSPORT OF ORE TO SEPARATION			
Actual and potential impacts on the environment	**Criteria for evaluation the environmental impact**		
	VU	**TP**	**R**
emission of noise from the trucks and loaders	3	1	3
Dust emissions from the loading of ore	3	1	3
Possibility of leakage of diesel fuel, oil and lubricants from the truck and loader	3	3	9

Table 13. *Evaluation the actual and potential impacts on the environment [6]*

Process, activity: USE AND TEMPORARY STORAGE OF OIL DERIVATES			
Actual and potential impacts on the environment	**Criteria for evaluation the environmental impact**		
	VU	**TP**	**R**
Soil pollution by oil, oil and lubricants	3	3	9
Washing of contaminated soil of atmospheric water, penetration and contamination of the river Ribnica	3	3	9
Occurrence of fire from refueling the oil derivates	3	3	9

Table 14. *Evaluation the actual and potential impacts on the environment [6]*

Process, activity: USE AND STORAGE THE BLASTING AGENTS			
Actual and potential impacts on the environment	**Criteria for evaluation the environmental impact**		
	VU	**TP**	**R**
Possibility of occurrence the uncontrolled explosions, fires and injuries of people	3	3	9
Damage or destruction of buildings in the immediate vicinity	3	3	9
Damage of mining equipment	3	3	9

NOTE: *Actual or potential impact on the environment where the ACCIDENT or EMERGENCY SITUATION may arise is not measured, but it is automatically treated as a SIGNIFICANT ASPECT OF THE ENVIRONMENT, which needs planning of appropriate protective measures.*

4.3. Register of significant environmental aspects with proposed environmental protection measures

After carried out identification and evaluation the aspects of impact on the environment, the Register of important aspects was established that need to have the implemented measures to eliminate, reduce risk and maintain the control over their estimated risks of environmental pollution.

Table 15. *Register of significant environmental aspects [6]*

No	**Registered significant aspect of the enviuronment**	**Risk**	**Environmental protection measures to be undertaken**				
			Technol.	**Technical**	**Organizational**	**Sanitary-hygienic**	**Administrative**
1	Penetration of waste in the river bed of Ribnica on excavation for entrance into the pit	8	✓	✓	✓	/	✓
2	The possibility of erosion of sedimentary material from the plateau and blurring of the river Ribnica	9	✓	✓	✓	/	✓
3	The formation and disposal of overburden excavation (sterile rocks) in front of the entrance to the pit	6	✓	✓	✓	/	/
4	The possibility of leakage from oil and grease from mining machinery and land pollution on a plateau in front of the pit	9	✓	✓	✓	/	/
5	Municipal waste in the execution of manipulative work in front of the entrance to the pi	6	/	/	✓	✓	✓

6	Municipal waste	9	/	/	✓	✓	✓
7	Soil contamination from temporary sanitary facilities	9	/	✓	✓	✓	✓
8	Water pollution from temporary sanitary facilities	9	/	✓	✓	✓	✓
9	The formation of waste from making the mine facilities	8	✓	✓	/	/	/
10	The possibility of leakage from oil and grease from mining machinery in the excavation of ore	9	/	/	✓	/	/
11	Possible contamination of the river Ribnica by the water polluted of mining machinery coming out of the mine facilities	9	✓	✓	✓	/	/
12	The possibility of leakage of diesel fuel, oil and grease from pit mining equipment for the transport of magnesite ore	9	/	/	✓	/	/
13	The possibility of leakage of diesel fuel, oil and lubricants from the trucks and loaders	9	/	/	✓	/	/
14	Soil pollution by oil, oil and lubricants	9	/	/	✓	/	/
15	Runoff of contaminated soil and atmospheric water penetration and pollution of the river Ribnica	9	✓	/	✓	/	/
16	Occurrence of fire from refueling oil derivates	9	/	/	✓	/	/
17	Uncontrolled possibility of explosions, fires and injuries of people	9	/	✓	✓	/	/
18	Damage or destruction of buildings in near the uncontrolled explosion	9	/	✓	✓	/	/
19	Mining equipment damage from uncontrolled explosion	9	/	✓	✓	/	/

6. CONCLUSION

Environmental policy in the implementation of a specific project should be based on knowledge the environmental aspects and significant impacts on the environment caused by the specific project.

Based on the previous experience and as the basis of these investigations, it can be concluded that a methodological approach, present in this work, to the identification and evaluation aspects of the environmental impact of the project "MAGNESITE MINING IN THE DEPOSIT CAVLOVAC - MASNICE" gave the best results of assessment the level of risk of environmental pollution and got another confirmation of suitability for further use in the same or similar projects, and that it will be highly useful for further optimization the development of this methodological procedure. Based on the above results, the suitable environmental protection measures are prescribed and present within the Study on environmental impact assessment for the Project "MAGNESITE MINING IN THE DEPOSIT CAVLOVAC – MASNICE". This study was the subject to public review and public debate. After completion of the procedure, a corresponding consent was give to the study of the impact assessment, what can be considered as a confirmation of eligibility the applied methodological approach.

REFERENCES

[1] Situation map of the mine "Ribnica" in scale of 1:1000 with drawn in boundaries of exploitation field;

[2] Topographic map of the narrow area of Zlatibor with drawn in mining field of the mine Ribnica;

[3] Feasibility study of magnesite mining from the deposit "Ribnica" – Zlatibor", drafted in October 2010 by the company "RDS group" from Bor;
[4] Decision of the Ministry of Science and Environmental Protection, which defines the scope and content of the Environmental Impact Assessment Study on magnesite mining in the deposit "Ribnica" - sites Čavlovac and Masnica in the village of Jablanica, Municipality Čajetina on the environment, No. 353-02-487/2005 -02 of 29.11.2005;
[5] N. Staletović, Development Planning the Environment – Direction to the Sustainable Development, QWERTY, Bor, 2006 ;
[6] N. Staletović, Nenadic D; Study on the environmental impact assessment for the project "MAGNESITE MINING IN THE DEPOSIT CAVLOVAC – MASNICA," MUNICIPALITY ČAJETINA; RdS, Bor, 2011;
[7] ISO 14001, (2005), System of Environmental Management - General guidelines on principles, systems and procedures, Institute for Standardization of Serbia, Belgrade;
[8] ISO 14004, (2004), System of Environmental Management - General guidelines on principles, systems and procedures, th Institute for Standardization of Serbia, Belgrade
[9] S. Kovačević, N. Staletović, N. Tucović, R. Janković; Quantitative risk assessment in the function in the integrated systems management, 14. DQM International Conference on Quality and Reliability Management ICDQM - 2011, (ISBN 978-86-86355-05 -8, pp.159-165), 29-30 June 2011, Belgrade, Serbia;
[10] THE WORLD BANK OPERATIONAL MANUAL Environmental Assessment; OP 4.01; January 1999;
[11] Law on Environmental Protection "RS Official Gazette", Nos. 135/04 and 36/2009;
[12] Law on Environmental Impact Assessment EIA "Official Gazette of RS", Nos. 135/04 and 36/2009.