



ARSENICPLATFORM

HUSRB/1002/121/075



Informisanje javnosti kao jedan od koraka ka rešavanju problema vodosnabdevanja

**A nyilvánosság értesítése mint egy lépés a
vízellátási probléma megoldásában**

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Departman za hemiju, biohemiju i zaštitu životne sredine



Projekat sufinansira
Evropska unija

Novi Sad, 21-22.10.2013.

Ciljevi projekta

Projekt célkitűzései

Formiranje zajedničke baze podataka o kvalitetu voda u oblastima obuhvaćenim projektom

Adaptaciju laboratorijskog prostora i nabavku mobilnog pilot postrojenja za tretman vode za piće

Naučno-istraživačke aktivnosti usmerene ka ispitivanju mogućnosti uklanjanja arsena iz vode

Organizovanje niza konferencija i radionica na kojima je vršena razmena ideja i rezultata istraživanja

Podizanje svesti o problemima vodosnabdevanja na teritoriji Vojvodine i Mađarske

Zašto je potrebna edukacija?



Podzemne vode sa visokim alkalitetom i sadržajem As, B, Na i NH_3 -izvor vode za piće za više od 1,8 miliona stanovnika u okrugu Csongrád i Bács-Kiskun (Mađarska) i u Bačkoj i Banatu (Srbija).

- As i NH_3 - iznad MDK za vodu za piće
- oko 40% populacije se snabdeva vodom za piće koja sadrži $> 10 \mu\text{g As/l}$
- TOC i do 20 mg C/l.

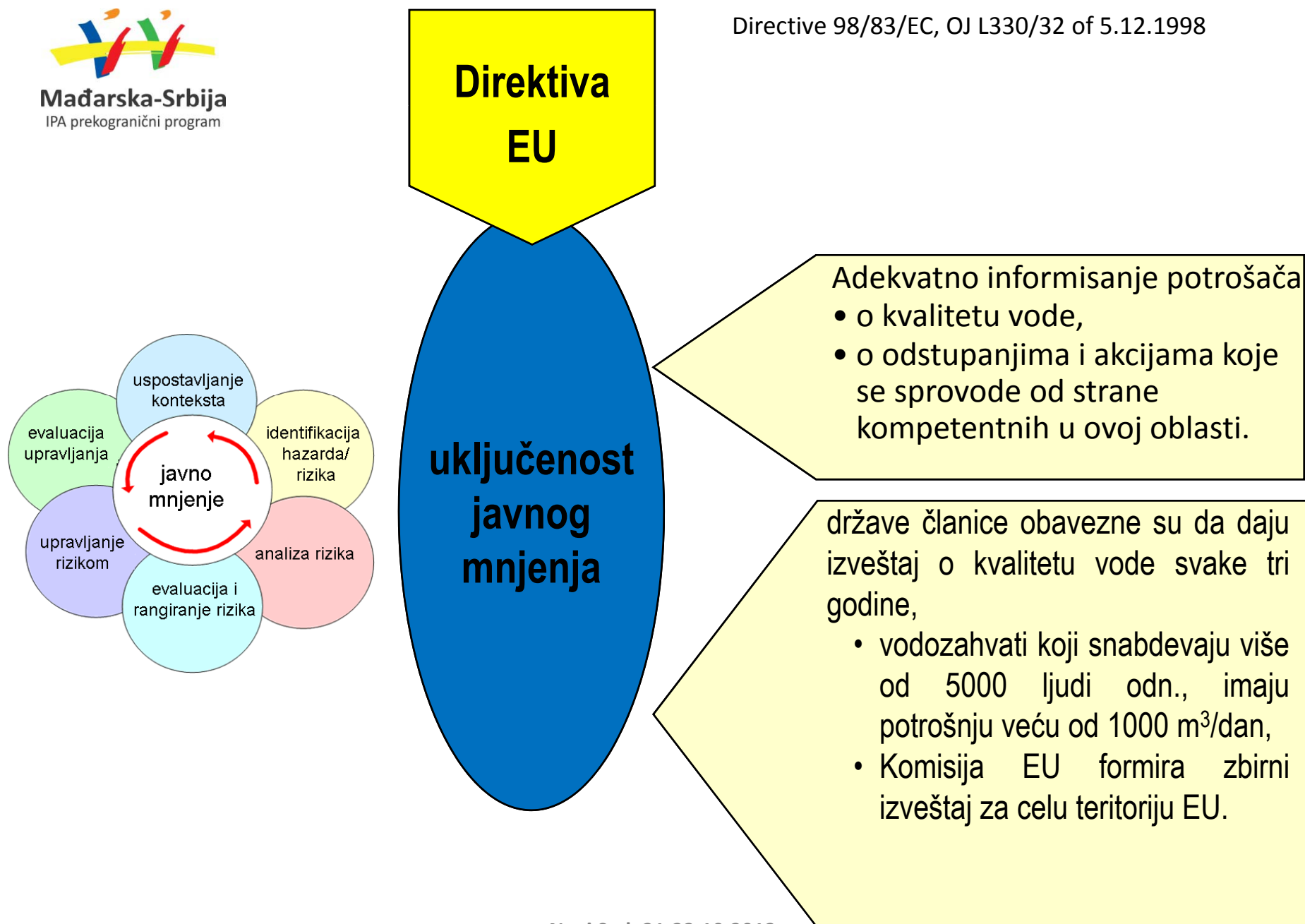
**Mali broj ljudi poznaje probleme
vodosnabdevanja, kao i mogućnosti
njihovog rešavanja**

Smernice Svetske zdravstvene organizacije za vodu za piće - 4. izdanje-

Everyone consumes water from one source or another, and consumers often play important roles in the collection, treatment and storage of water. Consumer actions may help to ensure the safety of the water they consume and may also contribute to improvement or contamination of the water consumed by others. Consumers have the responsibility for ensuring that their actions do not have an adverse impact on water quality.

<http://www.who.int>

Potrošači često imaju važnu ulogu kada je u pitanju vodosnabdevanje. Aktivnosti potrošača mogu da pomognu da se obezbedi i održi bezbednost vode koju troše, mogu doprineti poboljšanju, ali i kontaminaciji vode koju troše drugi. Potrošači imaju odgovornost da obezbede da njihovi postupci nemaju negativan uticaj na kvalitet vode.

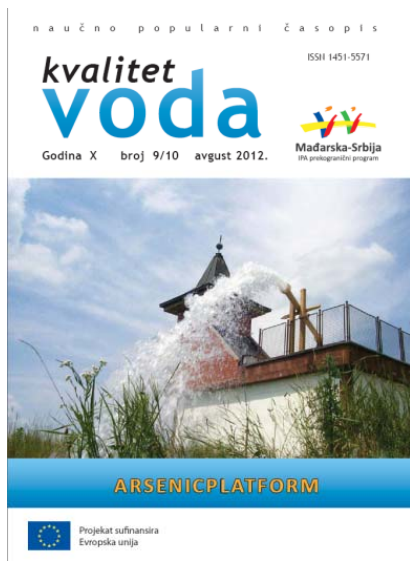




Mađarska-Srbija
IPA prekogranični program

Disiminacija, promotivne aktivnosti

AKTIVNOSTI ARSENICPLATFORM ARSENICPLATFORM AKTIVITÁSOK



Promotivni materijal

- Lifleći
- Baneri
- Kese
- Blokovi
- Časopis



Novi Sad, 21-22.10.2013.

Bilateralne konferencije, workshop-ovi



Baja, 24.01.2012.
Zajednička implementacija Platforme

Novi Sad, 21-22.10.2013.

Kikinda, 23-24.02.2012.
Uloga pilot projekata u ispitivanju vode za piće i
projektovanju postrojenja za pripremu vode za piće

Bilateralne konferencije, workshop-ovi



Novi Sad, 04-05.09.2012.
Problemi u upravljanju snabdevanjem vodom za
piće, uključujući i zakonodavna pitanja



Baja, 11-12.03.2013.
Predstavljenje rezultata projekta

Novi Sad, 21-22.10.2013.

Bilateralne konferencije, workshop-ovi

Više od 400 stručnjaka iz oblasti
vodosnabdevanja



Novi Sad, 06-07.06.2013.

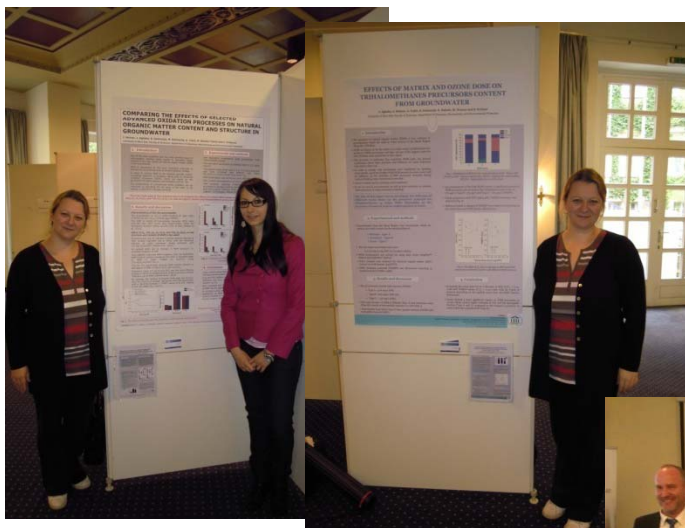
Održiva tehnološka rešenja za uklanjanje arsena, amonijaka i prirodnih organskih materija iz podzemne vode

Novi Sad, 03-06.09.2013.

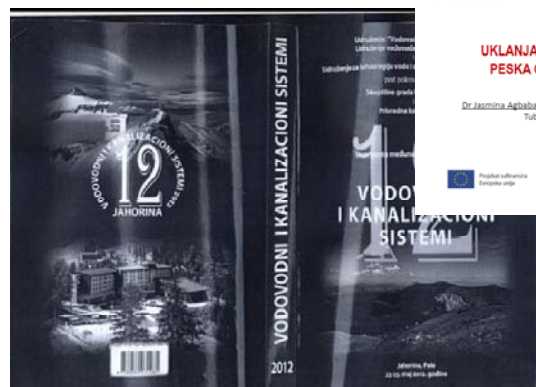
Rešenja za otpadne tokove sa postrojenja za pripremu vode za piće

Novi Sad, 21-22.10.2013.

Naučne konferencije



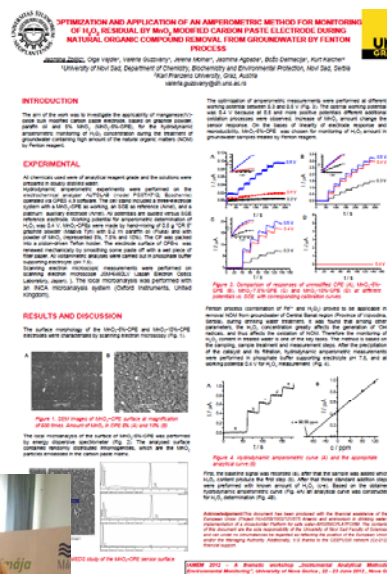
6th IWA Specialist Conference –
Oxidation Technologies for water and
wastewater treatment
Goslar, Germany



„Vodovodni i kanalizacioni
sistemi“
Jahorina, BiH

Novi Sad, 21-22.10.2013.

AKTIVNOSTI ARSENICPLATFORM
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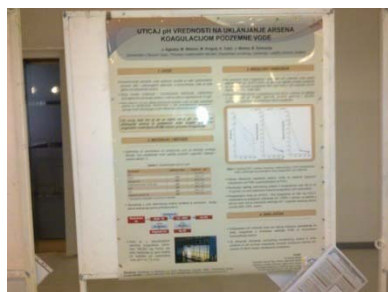


19th Young
Investigators' Seminar
on Analytical
Chemistry, YISAC 2012
Nova Gorica, Slovenia



XVII Országos Víziközmű Konferencia
Sopron, Hungary

Naučne konferencije



*6th Symposium Chemistry and Environmental Protection
EnviroChem 2013
Vršac, Srbija*

*Humboldt-Kolleg - Resources of Danubian Region: the Possibility of Cooperation and utilization
Belgrade, Serbia*

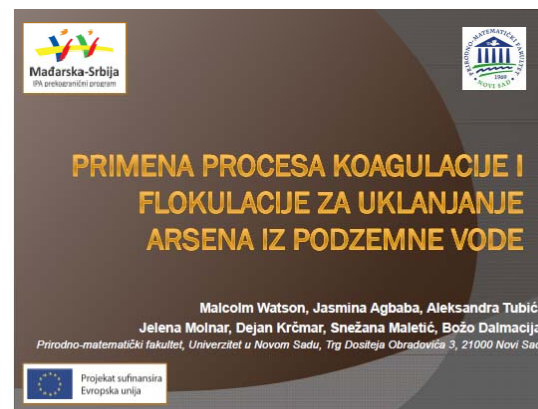


*“Vodovod i kanalizacija ‘13”
Tara, Srbija*

AKTIVNOSTI ARSENICPLATFORM ARSENICPLATFORM AKTIVITÁSOK



*8th International Conference of the Chemical Societies of the South-East European Countries
Belgrade, Serbia*



Perućac, Srbija

Novi Sad, 21-22.10.2013.



Mađarska-Srbija
IPA prekogranični program

Naučni časopisi

Chemical Engineering Journal

Accepted Manuscript

The effects of nutrients and ozone dose on changes in the characteristics of natural organic matter

Jelena Molnar, Jasmina Aghaba, Božo Dalmacija, Aleksandra Tubić, Dejan Krmar, Snežana Malešić, Dragana Tomasević

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Effects of Pre-ozoneation on the Removal of Natural Organic Matter and Haloacetic Acids Precursors by Coagulation

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Abstract

This study investigates the influence of oxidation pretreatment by ozone on the efficacy of coagulation for removing natural organic matter (NOM) from groundwater, which is used as a drinking water source for the Central Banat region (Northern Serbia). By using coagulation alone, the maximum removal of NOM and haloacetic acids (HAAs) precursors from water was achieved with 200 mg FeCl₃ (23% DOC and 44% HAAPs). When it comes to combined processes, changes in the NOM structure during pre-ozoneation resulted in significant improvement of the coagulation efficacy in the NOM removal, compared to coagulation alone. For the total NOM removal, the most effective was a combination of a higher ozone dose of 3.3 mg O₃/mg DOC with 200 mg FeCl₃ (48% DOC), while optimal HAA precursors reduction of 88% HAAPF was achieved using a lower ozone and coagulant dose of 1.3 mg O₃/mg DOC and 150 mg FeCl₃.

Keywords: natural organic matter; haloacetic acids; ozonation; coagulation

Introduction

In the region of Central Banat (Republic of Serbia), as well as in the majority of communities in the region, groundwater is used as a water supply source for industry. One of the basic problems and the most common cause of unacceptable drinking water quality in this region is the high content of natural organic matter (NOM) in the groundwater.

Natural organic matter is a complex mixture of organic compounds present in all natural waters, which consists of a range of different compounds, from largely aliphatic to highly oxidized aromatics. The hydrophobic part is rich in aromatic carbon, having phenolic structures and conjugated double bonds, while hydrophilic NOM contains a higher proportion of aliphatic carbon and nitrogenous compounds such as carbohydrates, proteins, sugars and amino acids.

The fraction of aquatic NOM, accounting for more than half of the dissolved organic carbon (DOC) in water (Bjelland et al., 2004). These hydrophobic acids may be described as humic substances classified as humic acids and fulvic acids (Battaglin et al., 2011). The presence of NOM can cause serious problems to drinking water quality and its treatment processes.

UDC: 502.51.504.5(497.113)



Insight into changes during coagulation in NOM reactivity for trihalomethanes and haloacetic acids formation

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ABSTRACT

Natural organic matter (NOM) in raw water can contribute in many ways to the poor quality of drinking water, including the formation of disinfection byproducts such as trihalomethanes (THM) and haloacetic acids (HAA) during disinfection. This paper investigated the role of individual NOM fractions on changes in THM and HAA formation during coagulation with iron chloride (FeCl₃) and a combination of polyaluminum chloride and iron chloride (FeCl₃/PACl). The dissolved organic carbon (DOC) in the raw water and after coagulation was fractionated into three fractions, based on their hydrophobicity. Experiments showed that most of the DOC (56%) in the raw water comes from the hydrophobic fraction, yielding 4% of the total THM precursors and 21% of the total HAA precursors. Both coagulants remove the humic acid fraction, but result in different changes in the reactivity of the remaining NOM fractions towards THM and HAA formation, indicating that coagulation occurs by different pathways, depending upon the type of coagulant used. In particular, significant changes in the reactivity of the hydrophilic and non-acidic fractions were observed.

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1. Introduction

Natural water used as a drinking water resource are of variable quality and can often not be used directly as drinking water. Raw water quality in most cases is influenced by the presence of mineral and organic matter, as a consequence of natural processes or anthropogenic activities.

The basic part of natural organic matter (NOM) in natural waters are humic materials, which are degradation products from plants and to a less extent animal tissues. Their structure is complex and characteristic for specific areas (Wilk et al., 2008). The influence of NOM on drinking water quality is significant and their presence is undesirable for a variety of reasons: NOM indicates the organoleptic quality of water; they can influence the regrowth of microorganisms in the distribution system creating biologically unstable water, depending on the biodegradable NOM fraction present (Chandrasekhar and Igwe, 2010). As a measure of NOM biodegradability, the biodegradable dissolved organic carbon (BDOC) parameter is often used (van der Kooij, 2003). Furthermore, if present in water resources, NOM could have negative influence through the increase of coagulant and disinfectant demand in drinking water treatment.

This could lead to the increase of disinfection byproducts (DBP) formation (Bjelland et al., 2005). Disinfection using chlorine is the most widely used method for this purpose. To date, more than 600 disinfection byproducts of chlorine have been identified, and the majority of them have a bad influence on human health. The most investigated chlorinated DBPs are trihalomethanes (THM) and haloacetic acids (HAA), which have maximum allowed levels in drinking water set by the World Health Organization, the European Commission as well as the United States Environmental Protection Agency (Bjelland et al., 2005). Despite the fact that much research has been done on this topic, they do not give a clear answer as to which kind of NOM are the most DBP formation. Generally, humic matter is considered as the main NOM fraction which reacts with chlorine and gives the most DBP (Liu and Backhouse, 2007; Chen et al., 2008). However, other authors in their research indicated that the hydrophilic fraction of NOM could be a significant potential for THM and HAA formation (Battaglin and Van, 2004).

For a better understanding of NOM structure on THM and HAA formation, which is important also for the treatment of water rich in NOM, it is valuable to know the structure of NOM and its change in water treatment. A number of methods have been developed for the isolation of NOM in water. Fractionation and ultrafiltration techniques are the fractionation methods in common use for separation of NOM in various portions (Wilk et al., 2008). One of the methods widely used for fractionation of specific components

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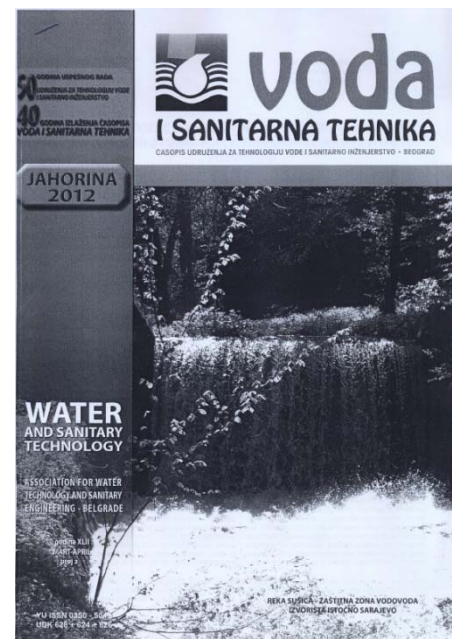
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Journal of Environmental Management

Water Research and Management

Novi Sad, 21-22.10.2013.

AKTIVNOSTI ARSENICPLATFORM ARSENICPLATFORM AKTIVITÁSOK



Voda i sanitarna tehnika/Water and Sanitary Technology

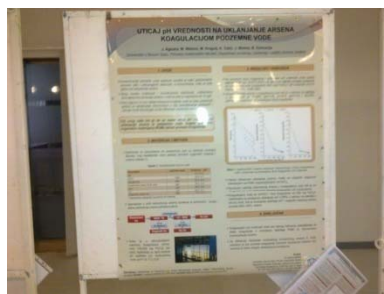
12

Naučna saopštenja i radovi

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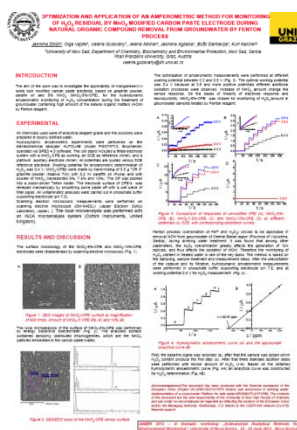
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Novi Sad, 21-22.10.2013.

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Mađarska-Srbija
IPA prekogranični program

AKTIVNOSTI ARSENICPLATFORM *ARSENICPLATFORM AKTIVITÁSOK*

Disiminacija, promotivne aktivnosti

15 škola širom Vojvodine:

- Subotica
- Zrenjanin
- Kikinda
- Bačka Topola
- Bečej
- Sombor
- Odžaci
- Senta
- Čoka
- Novi Kneževac
- Nova Crnja
- Novi Sad

Više od 500 učenika



Novi Sad, 21-22.10.2013.



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Mađarska-Srbija
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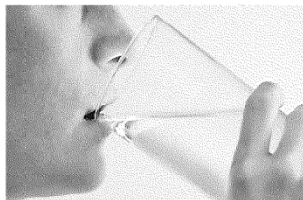
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Disiminacija, promotivne aktivnosti

КАКВУ ВОДУ ПИЈЕМО У ВОЈВОДИНИ

Арсен у чашама Банаћана

стр. 7



КАКВУ ВОДУ ПИЈЕМО У ВОЈВОДИНИ

Арсен и даље у чашама Банаћана

Проблем повишеног нивоа арсена у подземним водама и води за пиће најжалост још увек није решен на територији АП Војводине, наглашено је на традиционалној регионалној „Квалитет вода – Water Workshop 2013“ у Војводини, иницијативом организације Де-партмана за хемију, биохемију и заштити животне средине и Природно-математичког факултета у Новом Саду, која је отворена уторак, 6. септембра.

И даље се преко 40 одсто становништва, о подручја Банаћа и Беока, односио око 800.000 становника, снабдева са водом која садржи повишен ниво арсена, а најгора је ситуација у општини

Зренјанин. Већина водовода у Војводини, сем суботичког, не поседује технологије за уклањање арсена из подземних вода. Те је његов садржај у води за пиће на већем делу територије АП Војводине ионад дозвољеног.

Најгора је ситуација у општини Зренјанин

Ова конференција је једна од водених у земљи из области квалитета воде за пиће, управљања квалитетом и водоснабдевањем уопште, управљања отпадним

тата воде за пиће, управљања квалитетом и водоснабдевањем уопште, управљања отпадним

тата воде за пиће, управљања квалитетом и водоснабдевањем уопште, управљања отпадним

Opasno

Арсен у води Војвођана

NOVI SAD - Више од 40 одсто становништва Војводине снабдева се водом која садржи знатно већу концентрацију арсена од дозвољене, реčено је на конференцији „Квалитет вода“ на Природно-математичком факултету у Новом Саду. У већини случајева концентрација арсена у води је од 50 до 100 милиграма по литру, али има и општина, као што је Зренјанин, где је концентрација арсена од 150 до 250 милиграма по литру.

TV emisije
Novinski članci
Radio emisije

vest

Војвођани пију воду са већом концентрацијом арсена од дозвољене

Autor: 24 sata 03.09.2013. - 16:00 [Komentara \(0\)](#)

Више од 40 одсто становништва Војводине снабдева се водом која садржи већу концентрацију арсена од дозвољене, реčено је данас на конференцији "Квалитет вода" на Природно-математичком факултету у Новом Саду.





Mađarska-Srbija
IPA prekogranični program

AKTIVNOSTI ARSENICPLATFORM *ARSENICPLATFORM AKTIVITÁSOK*

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Hvala na pažnji!
Köszönöm a figyelmet!

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