



**ИНСТИТУТ ЗА ПРИМЕНУ
НУКЛЕАРНЕ ЕНЕРГИЈЕ**



**2. Scientific Conference
ENVIRONMENTAL PROTECTION AND
SUSTAINABLE DEVELOPMENT**

**2. Naučna konferencija
ZAŠTITA ŽIVOTNE SREDINE I
ODRŽIVI RAZVOJ**

**International meeting
Međunarodni skup**

**ABSTRACT BOOK
ZBORNIK
KRATKIH SADRŽAJA RADOVA**

BELGRADE

October, 3 - 5. 2024.

3 - 5. Oktobar, 2024.

2. SCIENTIFIC CONFERENCE

ENVIRONMENTAL PROTECTION AND SUSTAINABLE DEVELOPMENT

International meeting

Organised by

Institute for the Application of Nuclear Energy – INEP, Zemun
Faculty of Applied Ecology “Futura”, Belgrade

Organizatori

Institut za primenu nuklearne energije – INEP
Fakultet za primenjenu ekologiju „Futura“, Beograd

In cooperation with/*U kooperaciji sa:*

- Institute for Public Health, Belgrade
- Military Geographical Institute, Belgrade
- Superlab, Belgrade
- Center for Eco-Toxicological Research Podgorica d.o.o., CETI, Republic of Montenegro
- Faculty of Law, Josip Juraj Strossmayer University in Osijek, Republic of Croatia
- Biotechnical Faculty, University of Bihać, Republic of Bosnia and Herzegovina
-

Belgrade, 3-5 October 2024
Beograd, 3-5 Oktobra 2024

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SECTIONS

- **Environmental protection and soil, water and air pollutants**
- **Impact of pesticides and drugs on the environment**
- **Economic, technical, technological and legal aspects of environmental protection (EU standards)**
- **Educational, health and cultural aspects of environmental protection**

PROGRAMME/PROGRAM KONFERENCIJE

THURSDAY/ČETVRTAK, October 3, 2024.

9.00 – 10.00	Registration of participants/Registracija učesnika
10.00 – 12.00	Opening Ceremony, Plenary lecture, Welcome reception/Svečano otvaranje Konferencije, Plenarno predavanje, Koktel Dobrodošlice
10.00 – 10.30	Opening Ceremony/Svečano otvaranje <i>Welcome address/Pozdravna reč</i> • Dean of the Faculty of Applied Ecology Futura/Dekan fakulteta za primenjenu ekologiju Futura <i>Prof. dr Vladica Ristić</i> • The Manager of the Institute for the Application of Nuclear Energy/Direktorka Instituta za primenu nuklearne energije – INEP <i>Dr Marija Gnjatović</i> • Representative of the Minister for Environmental Protection/Izaslanica Ministrice za zaštitu životne sredine, drž. sekretar <i>Sara Pavkov</i>
10.30 – 11.00	Plenary lecture/Plenarno predavanje The impact of submicron sized plastics on human health – new tools to decipher the molecular mechanisms/ <i>Uticaj plastike submikronske veličine na ljudsko zdravlje – novi alati za dešifrovanje molekularnih mehanizama</i> <i>Miodrag Stojković</i>
11.00 – 12.00	Welcome reception/Koktel dobrodošlice

THURSDAY/ČETVRTAK, October 3, 2024.

- 12.00 – 14.25 ENVIRONMENTAL PROTECTION AND SOIL, WATER AND AIR POLLUTANTS/ SESSION I**
Moderators/Moderatori
Andrej Šoštarić, Anka Cvetković, Bojana Knežević
- 12.00 – 12.15 Nuclear accidents – past, present and maybe the future/Nuklearni akcidenti – prošlost, sadašnjost, a možda i budućnost**
Ana A. Čučulović, Jelena N. Stanojković, Rodoljub D. Čučulović
- 12.15 – 12.30 Understanding air quality: The PM2.5 /PM10 levels in Belgrade, Serbia/Razumevanje kvaliteta vazduha: PM2,5 /PM10 nivoi u Beogradu, Srbija**
Anka Cvetković, Andrej Šoštarić, K. Radusin
- 12.30 – 12.45 Air Quality monitoring in Belgrade-an overview/ Monitoring kvaliteta vazduha u Beogradu - Pregled**
Andrej Šoštarić, Anka Cvetković , K. Radusin
- 12.45 – 13.00 Did wildfire on Stara Planina Mt. have an effect on the chemical status of rivers a year after?/Da li je požar na Staroj planini uticao na hemijski status reka godinu dana kasnije?**
Aleksandra Mihajlidi-Zelić, Sanja Sakan, Igor Kodranov, Ljubiša Ignjatović, Dragana Đorđević
- 13.00 – 13.15 Analysis of Pollutants in the Tara and Čehotina Rivers – compliance with Environmental Quality Standards/Analiza zagađujućih supstanci u rijekama Tari i Čehotini – usklađenost sa standardima kvaliteta životne sredine**
Anja Babić, Bojana Knežević
- 13.15 – 13.30 Environmental impact of farm animals - current state and legislation in Macedonia/Uticaoj domaćih životinja na životnu sredinu - aktuelno stanje i zakonodavstvo u Makedoniji**
Miroslav Čosevski, Ena Dobrić, Romel Vele
- 13.30 – 13.45 Recognizability importance of decarbonization of the construction sector through the aspect of climate change/Prepoznatljivost značaja dekarbonizacije građevinskog sektora kroz aspekt klimatskih promena**
Ivana Šekler, Mirjana Bartula, Tanja Čupać, Vladimir Janković

THURSDAY/ČETVRTAK, October 3, 2024.

- 13.45 – 14.00 **Utilization of grasses in phytoremediation of flotation tailings/Primena trava u fitoremedijaciji odlagališta flotacione jalovine**
Gordana Andrejić, Nikola Milanović, Snežana Brajević, Uroš Aleksić, Aleksandar Simić, Željko Dželetović, Tamara Rakić
- 14.00 – 14.15 **Removal of cadmium ions from mine acid waters using limestone material/Uklanjanje jona kadmijuma iz rudničkih kiselih voda primenom krečnjačkog materijala**
Bojana Knežević, Vlatko Kastratović
- 14.15 – 14.25 **Discussion/Diskusija**
- 14.25 – 15.30 **Lunch/Pauza za ručak**
- 15.30 – 16.55 IMPACT OF PESTICIDES AND DRUGS ON THE ENVIRONMENT/SESSION II**
Moderators/Moderatori
Silva Dobrić, Vitomir Ćupić, Silvestra Kobal
- 15.30 – 15.45 **Old pesticides, new effects - an example of anticoagulant rodenticides/Stari pesticidi, novi efekti – primer antikoagulantnih rodenticida**
M. Kataranovski, I. Mirkov, A. Popov Aleksandrov, D. Kataranovski
- 15.45 – 16.00 **Ecotoxicological properties of the disinfectants, insecticides and rodenticides and their role in emergency situations/Ekotoksikološke osobine sredstava za dezinfekciju, dezinsekciju i deratizaciju i njihov značaj u vanrednim situacijama**
Silvestra Kobal, Martin Dobeic
- 16.00 – 16.15 **The impact of disinfectants, which are used to disinfect animals and maintain hygiene on farms, on the environment/Uticaj Dezinficijensa, koji se koriste za dezinfekciju životinja i održavanje higijene na farmama na životnu sredinu**
Romel Velez, Miroslav Ćosevski, Ena Dobrić, Dejana Ćupić Miladinović
- 16.15 – 16.30 **Impact of insecticides on the environment and environmentally acceptable remediation measures/Uticaj insekticida na životnu sredinu i ekološki prihvatljive mere remedijacije**
Vitomir Ćupić, Mirjana Bartula, Svetozar Krstić, Silva Dobrić, Saša Vasilev

THURSDAY/ČETVRTAK, October 3, 2024.

- 16.30 – 16.45 **Ecopharmacovigilance - the way to protect the environment from the harmful effects of drugs/ *Ekofarmakovigilanca – put ka očuvanju životne sredine od štetnih uticaja lekova***
Silva Dobrić, Vitomir Čupić
- 16.45 – 16.55 **Discussion/ *Diskusija***
- 16.55 – 20.00 **Free time/*Slobodno vreme***
- 20.00-23.30 ***GALA DINNER/SVEČANA VEČERA***

FRIDAY/PETAK, October 4, 2024.

- 9.30 – 11.40 ECONOMIC, TECHNICAL, TECHNOLOGICAL AND LEGAL ASPECTS OF ENVIRONMENTAL PROTECTION (EU STANDARDS)/*SESSION III***
Moderators/Moderatori
Svetozar Krstić, Velibor Spalević, Biljana Činčurak Erceg
- 9.30 – 9.45 **The European legal framework for sustainable waste management/*Evropski pravni okvir za održivo upravljanje otpadom***
Biljana Činčurak Erceg
- 9.45 – 10.00 **Fiscal environmental protection policy and environmental taxes/*Fiskalna politika zaštite okoliša i ekološki porezi***
Renata Perić, Emina Jerković
- 10.00 – 10.15 **Achieving Resilience: Sustainable Watershed Management in Montenegro's Danube River Basins/*Postizanje otpornosti: Održivo upravljanje slivovima Dunavskog basena Crne Gore***
Velibor Spalević
- 10.15 – 10.30 **Green transport agenda - Myth or achievable goal/*Zelena prometna agenda – mit ili ostvariv cilj***
Aleksandra Vasilj
- 10.30 – 10.45 **Navigating AI and Environmental Protection regulation: Challenges in the European Union/*Upravljanje AI i regulativa o zaštiti životne sredine: Izazovi u Evropskoj uniji***
Dunja Duić
- 10.45 – 11.00 **Ecotourism as a function of sustainability/*Ekoturizam u funkciji održivosti***
Svetozar Krstić, Vitomir Čupić, Vladimir Krstić

FRIDAY/PETAK, October 4, 2024.

- 11.00 – 11.15 **Green franchising – connecting sustainability and Franchising/*Zeleni franšizing – povezivanje održivosti i franšizinga***
Aleksandar Erceg, Rita-Krin Boduljak, Ljiljana Kukec
- 11.15 – 11.30 **Erosion Potential Method Application for Soil Loss Estimation in Alfenas, Minas Gerais, Brazil/*Primena metoda potencijala erozije na procenu gubitaka zemljišta u Alfenasu, Minas Žerais, Brazil***
Bruno Aurélio Silva, Guilherme da Silva Rios, Derielsen Brandão Santana, Joaquim Ernesto Bernardes Ayer, Velibor Spalevic, Ronaldo Luiz Mincato
- 11.30 – 11.40 **Discussion/*Diskusija***
- 11.40 – 12.00 **Coffee break/*Pauza za kafu***
- 12.00 – 14.15 EDUCATIONAL, HEALTH AND CULTURAL ASPECTS OF ENVIRONMENTAL PROTECTION/*SESSION IV***
Moderators/Moderatori
Saša Vasilev, Biljana Prodović Milojković, Nada Kosanović
- 12.00 – 12.20 **Stem cells: to treat and understand diseases/*Matične ćelije: za lečenje i razumevanje bolesti***
Miodrag Stojković
- 12.20 – 12.35 **Toxic effects of chemical substances - mechanisms and clinical manifestations/*Toksično delovanje hemijskih supstancija - mehanizmi i kliničke manifestacije***
Vitomir Čupić, Silva Dobrić, Mirjana Bartula, Svetozar Krstić, Saša Vasilev
- 12.35 – 12.50 **Pig production and *Trichinella*, environment and sustainability/ *Uzgoj svinja i uticaj trihinela na životnu sredinu***
Saša Vasilev, Branko Suvajdzić, Ivana Mitić, Vitomir Čupić, Dragan Vasilev
- 12.50 – 13.05 **„Green recovery”from Covid-19“ - a new vision of the impact of climate change on the emergence of pandemics /*Zeleni oporavak od Covid-19 – nova vizija uticaja klimatskih promena na pojavu pandemija* -**
Biljana Prodović Milojković, Tanja Prodović, Šćepan Sinanović

FRIDAY/PETAK, October 4, 2024.

- 13.05 – 13.20 **Rural tourism as a factor of the competitiveness of the Srem district/ *Ruralni turizam kao faktor konkurentnosti sremskog okruga***
Nada Kosanović, Goran Knežević
- 13.20 – 13.35 **The index of boniness in different types of donkeys/*Indeks koščatosti kod različitih tipova magaraca***
Milivoje Urošević, Milena Đorđević,
Dejana Čupić Miladinović, Yusuf Ograk, Nikola Cukić
- 13.35 – 13.50 **Necessary amounts of water for successful free-ranging donkey farming/ *Potrebne količine vode za uspešan slobodan uzgoj magaraca***
Milivoje Urošević, Danka Štastna, Pavel Štastny, Tsegmid Namsraiija
- 13.50 – 14.05 **Touch with nature's intelligence/*Dodir sa inteligencijom prirode***
Ivan Jušković
- 14.05 – 14.15 **Discussion/*Diskusija***
- 14.15 – 15.15 **Lunch/*Pauza za ručak***
- 16.00 – 17.00 **Visit to the Botanical Garden/*Poseta Botaničkoj Bašti***

SATURDAY/SUBOTA, October 5, 2024.

- 10.00 – 12.00 **Visit to the Special Nature Reserve Zasavica/ *Poseta Specijalnom rezervatu prirode Zasavica***
- 12.00 – 12.30 **Conclusions and closing of the Conference/*Zaključci i zatvaranje Konferencije***

ABSTRACT BOOK
ZBORNIK
KRATKIH SADRŽAJA RADOVA

CONTENTS/SADRŽAJ

Plenary lecture/Plenarno predavanje 16

Miodrag Stojković

THE IMPACT OF SUBMICRON SIZED PLASTICS ON HUMAN HEALTH – NEW TOOLS TO DECIPHER THE MOLECULAR MECHANISMS/*UTICAJ PLASTIKE SUBMIKRONSKE VELIČINE NA LJUDSKO ZDRAVLJE – NOVI ALATI ZA DEŠIFROVANJE MOLEKULARNIH MEHANIZAMA 17*

Environmental protection and soil, water and air pollutants 19

Ana A. Čučulović, Jelena N. Stanojković, Rodoljub D. Čučulović

NUCLEAR ACCIDENTS – PAST, PRESENT AND MAYBE THE FUTURE/*NUKLEARNI AKCIDENTI – PROŠLOST, SADAŠNJOST, A MOŽDA I BUDUĆNOST 20*

Anka Cvetković, Andrej Šoštarić, K. Radusin

UNDERSTANDING AIR QUALITY: THE PM_{2.5} /PM₁₀ LEVELS IN BELGRADE, SERBIA/*RAZUMEVANJE KVALITETA VAZDUHA: PM_{2,5} /PM₁₀ NIVOI U BEOGRADU, SRBIJA 21*

Andrej Šoštarić, Anka Cvetković, K. Radusin

AIR QUALITY MONITORING IN BELGRADE-AN OVERVIEW/*MONITORING KVALITETA VAZDUHA U BEOGRADU - PREGLED 22*

Aleksandra Mihajlidi-Zelić, Sanja Sakan, Igor Kodranov, Ljubiša Ignjatović, Dragana Đorđević

DID WILDFIRE ON STARA PLANINA MT. HAVE AN EFFECT ON THE CHEMICAL STATUS OF RIVERS A YEAR AFTER?/*DA LI JE POŽAR NA STAROJ PLANINI UTICAO NA HEMIJSKI STATUS REKA GODINU DANA KASNIJE?..... 24*

Anja Babić, Bojana Knežević

ANALYSIS OF POLLUTANTS IN THE TARA AND ĆEHOTINA RIVERS – COMPLIANCE WITH ENVIRONMENTAL QUALITY STANDARDS/*ANALIZA ZAGAĐUJUĆIH SUPSTANCI U RIJEKAMA TARI I ĆEHOTINI – USKLAĐENOST SA STANDARDIMA KVALITETA ŽIVOTNE SREDINE 25*

Miroslav Ćosevski, Ena Dobrić, Romel Velev

ENVIRONMENTAL IMPACT OF FARM ANIMALS - CURRENT STATE AND LEGISLATION IN MACEDONIA/*UTICAJ DOMAĆIH ŽIVOTINJA NA ŽIVOTNU SREDINU - AKTUELNO STANJE I ZAKONODAVSTVO U MAKEDONIJI 26*

Ivana Šekler, Mirjana Bartula, Tanja Cupać, Vladimir Janković

RECOGNIZABILITY IMPORTANCE OF DECARBONIZATION OF THE CONSTRUCTION SECTOR THROUGH THE ASPECT OF CLIMATE CHANGE/*PREPOZNATLJIVOST ZNAČAJA DEKARBONIZACIJE GRAĐEVINSKOG SEKTORA KROZ ASPEKT KLIMATSKIH PROMENA 28*

Gordana Andrejić, Nikola Milanović, Snežana Brajević, Uroš Aleksić, Aleksandar Simić, Željko Dželetović, Tamara Rakić

UTILIZATION OF GRASSES IN PHYTOREMEDIATION OF FLOTATION TAILINGS/PRIMENA TRAVA U FITOREMEDIJACIJI ODLAGALIŠTA FLOTACIONE JALOVINE 29

Bojana Knežević, Vlatko Kastratović

REMOVAL OF CADMIUM IONS FROM MINE ACID WATERS USING LIMESTONE MATERIAL/UKLANJANJE JONA KADMIJUMA IZ RUDNIČKIH KISELIH VODA PRIMENOM KREČNJAČKOG MATERIJALA 30

Impact of pesticides and drugs on the environment 32

M. Kataranovski, I. Mirkov, A. Popov Aleksandrov, D. Kataranovski

OLD PESTICIDES, NEW EFFECTS - AN EXAMPLE OF ANTICOAGULANT RODENTICIDES/STARI PESTICIDI, NOVI EFEKTI – PRIMER ANTIKOAGULANTNIH RODENTICIDA 33

Silvestra Kobal, Martin Dobeic

ECOTOXICOLOGICAL PROPERTIES OF THE DISINFECTANTS, INSECTICIDES AND RODENTICIDES AND THEIR ROLE IN EMERGENCY SITUATIONS/EKOTOKSIKOLOŠKE OSOBINE SREDSTAVA ZA DEZINFEKCIJU, DEZINSEKCIJU I DERATIZACIJU I NJIHOV ZNAČAJ U VANREDNIM SITUACIJAMA 34

Romel Velez, Miroslav Čosevski, Ena Dobrić, Dejana Čupić Miladinović

THE IMPACT OF DISINFECTANTS, WHICH ARE USED TO DISINFECT ANIMALS AND MAINTAIN HYGIENE ON FARMS, ON THE ENVIRONMENT/UTICAJ DEZINFICIJENSA, KOJI SE KORISTE ZA DEZINFEKCIJU ŽIVOTINJA I ODRŽAVANJE HIGIJENE NA FARMAMA NA ŽIVOTNU SREDINU 35

Vitomir Čupić, Mirjana Bartula, Svetozar Krstić, Silva Dobrić, Saša Vasilev

IMPACT OF INSECTICIDES ON THE ENVIRONMENT AND ENVIRONMENTALLY ACCEPTABLE REMEDIATION MEASURES/ UTICAJ INSEKTICIDA NA ŽIVOTNU SREDINU I EKOLOŠKI PRIHVATLJIVE MERE REMEDIJACIJE 36

Silva Dobrić, Vitomir Čupić

ECOPHARMACOVIGILANCE - THE WAY TO PROTECT THE ENVIRONMENT FROM THE HARMFUL EFFECTS OF DRUGS/ EKOFARMAKOVIGILANCA – PUT KA OČUVANJU ŽIVOTNE SREDINE OD ŠTETNIH UTICAJA LEKOVA 38

Economic, technical, technological and legal aspects of environmental protection (EU standards) 40

Biljana Činčurak Erceg

THE EUROPEAN LEGAL FRAMEWORK FOR SUSTAINABLE WASTE MANAGEMENT/*EVROPSKI PRAVNI OKVIR ZA ODRŽIVO UPRAVLJANJE OTPADOM* 41

Renata Perić, Emina Jerković

FISCAL ENVIRONMENTAL PROTECTION POLICY AND ENVIRONMENTAL TAXES/*FISKALNA POLITIKA ZAŠTITE OKOLIŠA I EKOLOŠKI POREZI* 42

Velibor Spalević

ACHIEVING RESILIENCE: SUSTAINABLE WATERSHED MANAGEMENT IN MONTENEGRO'S DANUBE RIVER BASINS/ *POSTIZANJE OTPORNOSTI: ODRŽIVO UPRAVLJANJE SLIVOVIMA DUNAVSKOG BASENA CRNE GORE* ... 43

Aleksandra Vasilj

GREEN TRANSPORT AGENDA - MYTH OR ACHIEVABLE GOAL/*ZELENA PROMETNA AGENDA – MIT ILI OSTVARIV CILJ* 44

Dunja Duić

NAVIGATING AL AND ENVIRONMENTAL PROTECTION REGULATION: CHALLENGES IN THE EUROPEAN UNION/ *UPRAVLJANJE AL I REGULATIVA O ZAŠTITI ŽIVOTNE SREDINE: IZAZOVI U EVROPSKOJ UNIJI* 46

Svetozar Krstić, Vitomir Ćupić, Vladimir Krstić

ECOTOURISM AS A FUNCTION OF SUSTAINABILITY/*EKOTURIZAM U FUNKCIJI ODRŽIVOSTI* 47

Aleksandar Erceg, Rita-Krin Boduljak, Ljiljana Kuček

GREEN FRANCHISING – CONNECTING SUSTAINABILITY AND FRANCHISING/*ZELENI FRANŠIZING – POVEZIVANJE ODRŽIVOSTI I FRANŠIZINGA* 48

Bruno Aurélio Silva, Guilherme da Silva Rios, Derielsen Brandão Santana, Joaquim Ernesto Bernardes Ayer, Velibor Spalevic, Ronaldo Luiz Mincato

EROSION POTENTIAL METHOD APPLICATION FOR SOIL LOSS ESTIMATION IN ALFENAS, MINAS GERAIS, BRAZIL/ *PRIMENA METODA POTENCIJALA EROZIJE NA PROCENU GUBITAKA ZEMLJIŠTA U ALFENASU, MINAS ŽERAIS, BRAZIL* 49

Educational, health and cultural aspects of environmental protection.....51

Miodrag Stojković

STEM CELLS: TO TREAT AND UNDERSTAND DISEASES/*MATIČNE ĆELIJE: ZA LEČENJE I RAZUMEVANJE BOLESTI* 52

<i>Vitomir Ćupić, Silva Dobrić, Mirjana Bartula, Svetozar Krstić, Saša Vasilev</i> TOXIC EFFECTS OF CHEMICAL SUBSTANCES - MECHANISMS AND CLINICAL MANIFESTATIONS/ <i>TOKSIČNO DELOVANJE HEMIJSKIH SUPSTANCIJA - MEHANIZMI I KLINIČKE MANIFESTACIJE</i>	53
<i>Saša Vasilev, Branko Suvajdžić, Ivana Mitić, Vitomir Ćupić, Dragan Vasilev</i> PIG PRODUCTION AND <i>TRICHINELLA</i> , ENVIRONMENT AND SUSTAINABILITY/ <i>UZGOJ SVINJA I UTICAJ TRIHINELA NA ŽIVOTNU SREDINU</i>	54
<i>Biljana Prodović Milojković, Tanja Prodović, Šćepan Sinanović</i> „GREEN RECOVERY”FROM COVID-19“ - A NEW VISION OF THE IMPACT OF CLIMATE CHANGE ON THE EMERGENCE OF PANDEMICS / <i>ZELENI OPORAVAK OD COVID-19 – NOVA VIZIJA UTICAJA KLIMATSKIH PROMENA NA POJAVU PANDEMIJA</i> -	56
<i>Nada Kosanović, Goran Knežević</i> RURAL TOURISM AS A FACTOR OF THE COMPETITIVENESS OF THE SREM DISTRICT/ <i>RURALNI TURIZAM KAO FAKTOR KONKURENTNOSTI SREMSKOG OKRUGA</i>	57
<i>Milivoje Urošević, Milena Đorđević, Dejana Ćupić Miladinović, Yusuf Ograk, Nikola Cukić</i> THE INDEX OF BONINESS IN DIFFERENT TYPES OF DONKEYS/ <i>INDEKS KOŠČATOSTI KOD RAZLIČITIH TIPOVA MAGARACA</i>	58
<i>Milivoje Urošević, Danko Štastna, Pavel Štastny, Tsegmid Namsraijav</i> NECESSARY AMOUNTS OF WATER FOR SUCCESSFUL FREE-RANGING DONKEY FARMING/ <i>POTREBNE KOLIČINE VODE ZA USPEŠAN SLOBODAN UZGOJ MAGARACA</i>	59
<i>Ivan Jušković</i> TOUCH WITH NATURE’S INTELLIGENCE/ <i>DODIR SA INTELIGENCIJOM PRIRODE</i>	61

Plenary lecture
Plenarno predavanje

THE IMPACT OF SUBMICRON - SIZED PLASTICS ON HUMAN HEALTH – NEW TOOLS TO DECIPHER THE MOLECULAR MECHANISMS

Miodrag Stojković

MEEI, Harvard Medical, Boston, Massachusetts, USA
SPEBO Medical, Leskovac, Serbia

Increased pollution by plastics has become a serious global environmental problem. Still, concerns for human health have been raised after the reported presence of sub-micron-sized plastics (SSP) in food and beverages. Unfortunately, few studies have investigated the potentially harmful effects on early human development and health. Therefore, we used new strategies to study the possible impact of polystyrene SSP on the transcription profile of preimplantation human embryos and human induced pluripotent stem cells (hiPSC). Transcriptomic and epigenomic signatures of fibroblasts used for derivation of hiPSC were defined using RNA-seq and whole genome methyl-seq, respectively. Both showed alterations in the expression of *ESRRB* and *HNFI*A genes and circuits involved in the pluripotency of stem cells, as well as in pathways involved in cancer, inflammatory disorders, gluconeogenesis, carbohydrate metabolism, innate immunity, and dopaminergic synapse. Similarly, the quantitative expression levels of identified key transcriptional and DNA methylation changes (*DNMT3A*, *FAM133CP*, *SEPTIN7P8*, and *TTC34*) were significantly ($p < 0.05$) affected in both PS-exposed fibroblasts and hiPSC. This study clearly illustrates the power of human models of environmental plastic pollution to narrow down and prioritize the list of candidate molecular biomarkers. This knowledge will facilitate the deciphering of the origins of environmental diseases.

UTICAJ PLASTIKE SUBMIKRONSKE VELIČINE NA LJUDSKO ZDRAVLJE – NOVI ALATI ZA DEŠIFROVANJE MOLEKULARNIH MEHANIZAMA

Miodrag Stojković

MEEI, Harvard Medical, Boston, Masačusets, SAD
SPEBO Medical, Leskovac, Srbija

Povećano zagađenje plastikom postalo je ozbiljan globalni ekološki problem. Ipak, zabrinutost za ljudsko zdravlje je povećana tek nakon izveštaja o prisustvu plastike submikronske veličine (SSP) u hrani i pićima. Nažalost, do danas mali broj studija istražuje potencijalno štetne efekte na rani ljudski razvoj i zdravlje. Zbog toga smo primenili nove strategije za proučavanje mogućeg uticaja polistirenskog SSP na profil transkripcije preimplantacionih ljudskih embriona i humanih indukovanih pluripotentnih matičnih ćelija (hiPSC). Transkriptomski i epigenomski potpisi fibroblasta koji se koriste za derivaciju hiPSC definisani su korišćenjem RNA i metil-sekvenciranja celog ljudskog genoma. Oba profila su pokazala promene u ekspresiji *ESRRB* i *HNFI*A gena i krugova uključenih u pluripotenciju matičnih ćelija, kao i na puteve uključene u nastanku raka, inflamatornih poremećaja, glukoneogenezu, metabolizam

ugljenih hidrata, urođeni imunitet i dopaminergičku sinapsu. Slično tome, kvantitativni nivoi ekspresije identifikovanih ključnih promena transkripcije i DNK metilacije (*DNMT3A*, *FAM133CP*, *SEPTIN7P8* i *TTC34*) su značajno ($p < 0,05$) bili pogođeni i kod fibroblasta izloženih PS i kod hiPSC. Ova studija jasno ilustruje moć ljudskih modela za ispitivanje zagađenja životne sredine plastikom kao i mogućnosti da suzi i odredi prioritete na listi kandidata za molekularne biomarkere i time olakšati dešifrovanje porekla ekoloških bolesti.

Environmental protection and
soil, water and air pollutants
Zaštita životne sredine i zagađivači
zemljišta, vode i vazduha

NUCLEAR ACCIDENTS - PAST, PRESENT AND MAYBE FUTURE

Ana Čučulović, Jelena Stanojković, Rodoljub Čučulović

University of Belgrade, Institute for the Application of Nuclear Energy – INEP, Zemun, Belgrade, Serbia

Business and Law Faculty, University MB, Belgrade, Serbia

Radioactive contamination is the unintentional and undesirable presence of radioactive elements on surface or within organism. Such contamination can be result of technological developments, peaceful nuclear energy use, experimental nuclear activities, and the use of nuclear weapons in warfare. To mitigate the risk of radioactive contamination, protective measures are being implemented. During the period from 1945 to 1987, 28 accidents occurred due to human actions. Before the Chernobyl accident (26.04.1986, Ukraine), there were three notable cases of unintentional radioactive leakage from nuclear power plants: Kyshtym i (1957), Windscale (1957), and Three Mile Island (1979). The incident at the Lenin nuclear power plant in Chernobyl resulted in global environmental contamination, with cesium residues are still present in Serbia to this day. At 1999 southern Serbia experienced contamination with long-lived radionuclides from depleted uranium used in the bombings. The Fukushima nuclear incident in Japan (2011) did not result in significant contamination in Serbia due to the considerable distance. Regardless of their development level, all states face common threats and risks in economic, informational, technological, biological, and nuclear security, which could potentially lead to new nuclear accidents.

NUKLEARNI AKCIDENTI – PROŠLOST, SADAŠNJOST, A MOŽDA I BUDUĆNOST

Ana Čučulović, Jelena Stanojković, Rodoljub Čučulović

Univerzitet u Beogradu, Institut za primenu nuklearne energije – INEP, Zemun, Beograd, Srbija

Poslovni i pravni fakultet, Univerzitet MB, Prote Mateje 21, 11000 Beograd, Srbija

Radioaktivna kontaminacija je neplanirano i nepoželjno prisustvo radioaktivnih elemenata na površini ili unutar organizma. Može da nastane usled tehnološkog razvoja, mirnodopskog korišćenja nuklearne energije, eksperimentalnih nuklearnih proba, kao i usled primene nuklearnog oružja u ratnim sukobima. U cilju sprečavanja radioaktivne kontaminacije stanovništva sprovode se mere zaštite. Čovekovim delovanjem u periodu od 1945. do 1987. godine desilo se 28 akcidenata. Do akcidenta u Černobilju (26.04.1986, Ukrajna) zabeležena su tri slučaja ispuštanja značajne radioaktivnosti iz nuklearnih elektrana u okolinu: Kištim (1957), Vindskejl (1957), Ostrvo Tri Milje (1979). U nuklearnoj elektrani Lenjin u Černobilju, desio se akcident koji je doveo do globalne kontaminacije životne sredine, pa i Srbije. Na teritoriji Republike

Srbije i danas su prisutne rezidue ^{137}Cs . Teritorija juga Srbije je 1999. godine dodatno kontaminirana dugoživećim radionuklidima u napadima agresora koji je koristio municiju sa osiromašenim uranijumom. Nuklearni akcident u Fukušimi (Japan) desio se 2011. godine, ali na sreću zbog velike udaljenosti nije doveo do kontaminacije životne sredine u Srbiji. Sve države se, bez obzira na stepen razvijenosti, suočavaju sa zajedničkim pretnjama i rizicima u oblasti ekonomske, informacione, tehnološke, biološke i nuklearne bezbednosti, koji mogu da dovedu do novih nuklearnih akcidenata.

UNDERSTANDING AIR QUALITY: THE PM_{2.5} /PM₁₀ LEVELS IN BELGRADE, SERBIA

Anka Cvetković , Andrej Šoštarić, K. Radusin

Institute of Public Health of Belgrade, Serbia

Air pollution is the most significant environmental health risk in Europe, causing cardiovascular and respiratory diseases that lead to the loss of healthy years of life and, in the worst cases, to preventable deaths. Despite constant improvements, exceedances of air quality standards are shared across the EU countries, with concentrations well above the target values. Despite reductions in emissions, in 2021. the most of the EU's urban population was exposed to crucial air pollutants that were damaging to health.

Particulate matter (PM) is a complex heterogeneous mixture whose size and chemical composition can change in time and space due to different chemical species bonded on their surfaces. PM less than 10 μm and 2.5 μm , directly effects air quality and human health. The aim of this paper was to evaluate PM₁₀ and PM_{2.5} level concentration as well as PM_{2.5}/PM₁₀ ratio as one of major components to health risk assessment in Belgrade urban area.

Concentrations of particulate matter PM₁₀ and PM_{2.5} were investigated at fourteen different stations, in framework of local monitoring network in wider Belgrade area. Sampling was conducted daily, during 2022. (one year sampling), by automatic monitors.

The obtained results have shown high value for daily PM₁₀ concentration, maximum value was 516,5 $\mu\text{g}/\text{m}^3$ at measurement site in Belgrade suburban regia, in winter. At the same site, concentration of PM 2.5 was 506,0 $\mu\text{g}/\text{m}^3$. PM_{2.5}/PM₁₀ ratio was from 0.64 to 0.71 at all measurement sites. External exposure assessment is a fundamental component (Bartzis et al., 2020). The Risk Assessment Information System (RAIS) was used to assess human health risk of PM_{2.5} and its influence on health.

The PM_{2.5}/PM₁₀ ratio is very important because PM_{2.5} can provoke more severe health effects due to its small size and chemical species adsorbed on its surface which enables their penetration deep into the lungs. That is why is very important to investigate mass concentration and chemical species absorbed on its surfaces.

RAZUMEVANJE KVALITETA VAZDUHA: PM_{2,5} /PM₁₀ NIVOI U BEOGRADU, SRBIJA

Anka Cvetković, Andrej Šoštarić, K. Radusin

Institut za javno zdravlje, Beograd, Srbija

Zagađenje vazduha je najznačajniji rizik za zdravlje životne sredine u Evropi, izazivajući kardiovaskularne i respiratorne bolesti koje dovode do gubitka zdravih godina života i, u najgorim slučajevima, do smrti koje se može sprečiti. Uprkos stalnim poboljšanjima, prekoračenja standarda kvaliteta vazduha su podeljena u zemljama EU, sa koncentracijama znatno iznad ciljnih vrednosti. Uprkos smanjenju emisija, 2021. godine većina urbanog stanovništva EU bila je izložena ključnim zagađivačima vazduha koji su bili štetni po zdravlje.

Čestice (PM) su složena heterogena smeša čija se veličina i hemijski sastav mogu menjati u vremenu i prostoru zbog različitih hemijskih vrsta vezanih na njihovim površinama. PM manji od 10 µm i 2,5 µm, direktno utiče na kvalitet vazduha i zdravlje ljudi. Cilj ovog rada je bio da se proceni koncentracija PM₁₀ i PM_{2,5}, kao i odnos PM_{2,5}/PM₁₀ kao jedne od glavnih komponenti procene zdravstvenog rizika u urbanom području Beograda.

Koncentracije čestica PM₁₀ i PM_{2.5} su ispitivane na četrnaest različitih stanica, u okviru lokalne mreže za praćenje na širem području Beograda. Uzorkovanje je vršeno svakodnevno, tokom 2022. godine (jednogodišnje uzorkovanje), automatskim monitorima.

Dobijeni rezultati su pokazali visoku vrednost dnevne koncentracije PM₁₀, maksimalna vrednost je bila 516,5 µg/m³ na mestu merenja u beogradskom prigradskom kraju, zimi. Na istom mestu koncentracija PM_{2,5} iznosila je 506,0 µg/m³. Odnos PM_{2,5}/PM₁₀ bio je od 0,64 do 0,71 na svim mestima merenja. Procena eksterne izloženosti je osnovna komponenta. Informacioni sistem za procenu rizika (RAIS) korišćen je za procenu rizika po zdravlje ljudi od PM_{2,5} i njegovog uticaja na zdravlje.

Odnos PM_{2,5}/PM₁₀ je veoma važan jer PM_{2,5} može izazvati teže posledice po zdravlje zbog svoje male veličine i hemijskih vrsta adsorbovanih na njegovoj površini što omogućava njihovo prodiranje duboko u pluća. Zbog toga je veoma važno istražiti koncentraciju mase i hemijskih vrsta apsorbovanih na njenim površinama.

AIR QUALITY MONITORING IN BELGRADE - AN OVERVIEW

Andrej Šoštarić, Anka Cvetković, K. Radusin

Institute of Public Health of Belgrade, Serbia

Air quality is one of the greatest, if not the greatest, environmental issues worldwide. This is mainly due to the increasing emissions from industrial and traffic sources of pollutants with adverse effects on human health and environment overall. More

than ever, air quality is under the spotlight, due to health related-risks as well as the inflated accessibility of information via internet technologies and mobile phone applications. In this paper the air quality monitoring network in Belgrade, along with related activities, will be presented. Additionally, the Institute of Public Health of Belgrade collaborates with national and international institutions, both governmental and scientific.

Institute of Public Health Belgrade (IPH) has been monitoring air quality in Belgrade since 1953. Initially, two sampling sites monitored three pollutants (SO_2 , NO_2 and soot). Today air quality monitoring network comprises of 40 monitoring sites, of which 30 are equipped with automatic monitoring stations, with over 50 pollutants being monitored (e.g., PM_{10} , $\text{PM}_{2.5}$, PAH, elemental analysis of PM, VOC, organic tracers and many more).

Automatic monitoring stations enable us to perform on-line monitoring with presenting results in near real-time. Besides concentrations of pollutants in ambient air, information includes air quality index calculations and related health recommendations for the general population and vulnerable groups.

The Institute of Public Health of Belgrade, with its state-of-the-art network, provides relevant and timely information to the public and generates data that supports strategic documents and scientific research. Additionally, the network generates substantial data used to develop strategic documents and support scientific research on air quality and health.

MONITORING KVALITETA VAZDUHA U BEOGRADU - PREGLED

Andrej Šoštarić, Anka Cvetković, K. Radusin

Institut za javno zdravlje, Beograd, Srbija

Kvalitet vazduha je jedan od najvećih, ako ne i najvećih ekoloških problema širom sveta. Ovo je uglavnom zbog povećanja emisija zagađujućih materija iz industrijskih i saobraćajnih izvora sa štetnim uticajima na zdravlje ljudi i životnu sredinu u celini. Kvalitet vazduha je više nego ikada u centru pažnje, zbog zdravstvenih rizika, kao i zbog prenaduvane dostupnosti informacija putem internet tehnologija i aplikacija za mobilne telefone. U ovom radu biće predstavljena mreža za praćenje kvaliteta vazduha u Beogradu, kao i prateće aktivnosti. Pored toga, Institut za javno zdravlje Beograda sarađuje sa domaćim i međunarodnim institucijama, kako državnim tako i naučnim.

Institut za javno zdravlje Beograd (IJZ) prati kvalitet vazduha u Beogradu od 1953. godine. U početku su dva mesta za uzorkovanje pratila tri zagađivača (SO_2 , NO_2 i čađ). Danas se mreža za praćenje kvaliteta vazduha sastoji od 40 lokacija za praćenje, od kojih je 30 opremljeno automatskim stanicama za praćenje, sa preko 50 zagađivača koji se prate (npr. PM_{10} , $\text{PM}_{2.5}$, PAH, elementarna analiza PM, VOC, organski tragači i još mnogo toga).

Automatske nadzorne stanice nam omogućavaju da vršimo on-line nadzor sa prezentovanjem rezultata u skoro realnom vremenu. Pored koncentracija zagađujućih materi-

ja u ambijentalnom vazduhu, informacije uključuju izračunavanje indeksa kvaliteta vazduha i odgovarajuće zdravstvene preporuke za opštu populaciju i ugrožene grupe. Institut za javno zdravlje Beograda, sa svojom najsavremenijom mrežom, pruža relevantne i pravovremene informacije javnosti i generiše podatke koji podržavaju strateška dokumenta i naučna istraživanja. Pored toga, mreža generiše značajne podatke koji se koriste za razvoj strateških dokumenata i podršku naučnim istraživanjima o kvalitetu i zdravlju vazduha.

DID WILDFIRE ON STARA PLANINA MT. HAVE AN EFFECT ON THE CHEMICAL STATUS OF RIVERS A YEAR AFTER?

Aleksandra Mihajlidi-Zelić, Sanja Sakan, Igor Kodranov, Ljubiša Ignjatović, Dragana Đorđević

Centre of Excellence in Environmental Chemistry and Engineering – Institute of Chemistry, Technology and Metallurgy, University of Belgrade, Serbia
Faculty of Chemistry, University of Belgrade, Belgrade, Serbia
Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia

The water quality of rivers, streams and lakes in the area where wildfire occurs, and downstream of it, is very often deteriorated. During active burning, ash can settle on water bodies, and storms following wildfires enhance the delivery of sediment, nutrients, and metals to downstream water bodies affecting water quality. The effects of wildfire can be detected months and years after the wildfire.

Nature park Stara Planina located in eastern Serbia, near the Serbia-Bulgaria state border, was affected by wildfire in 2019 (October 28 to November 3).

For the first study on the eco-chemical status of rivers of Stara Planina Mt. water samples of rivers were taken in August 2020. Concentrations of elements and anions were determined by ICP-OES, ICP-MS and IC. The performed analysis also enabled the examination of the potential effect of the 2019 wildfire on the chemical status of rivers closest to the burned area.

Obtained results indicate that with the exception of iron, rivers in the vicinity of the area burned by wildfire have a good chemical status (surface water quality Class I). High concentrations of Fe in Dojkinačka, Javorska and Toplodolska rivers (rivers closest to the burned area) and higher concentrations of Pb, Cr, Mn and Al detected in Dojkinačka river, compared to other investigated rivers, could indicate, that a year after the wildfire, along with natural processes (rock weathering, soil erosion), wildfire has some impact on contents of these elements in river water.

DA LI JE POŽAR NA STAROJ PLANINI UTICAO NA HEMIJSKI STATUS REKA GODINU DANA KASNIJE?

Aleksandra Mihajlidi-Zelić, Sanja Sakan, Igor Kodranov, Ljubiša Ignjatović, Dragana Đorđević

Centar izvrsnosti u hemiji i inženjerstvu životne sredine – Institut za hemiju, tehnologiju i metalurgiju Univerziteta u Beogradu, Srbija
Hemijski fakultet Univerziteta u Beogradu, Beograd, Srbija
Fakultet za fizičku hemiju Univerziteta u Beogradu, Beograd, Srbija

Kvalitet vode u rekama, potocima i jezerima na području gde nastaju požari, kao i nizvodno od njega, veoma je često pogoršan. Tokom aktivnog sagorevanja, pepeo se može taložiti na vodenim tijelima, a oluje nakon šumskih požara povećavaju isporuku sedimenta, hranljivih materija i metala u nizvodna vodna tijela što utiče na kvalitet vode. Posledice šumskog požara mogu se otkriti mesecima i godinama nakon požara.

Park prirode Stara planina, koji se nalazi u istočnoj Srbiji, u blizini srpsko-bugarske državne granice, zahvaćen je požarima 2019. godine (28. oktobra do 3. novembra).

Za prvu studiju o eko-hemijskom statusu reka Stare planine uzorci vode reka uzeti su u avgustu 2020. Koncentracije elemenata i anjona određivane su ICP-OES, ICP-MS i IC. Urađena analiza omogućila je i ispitivanje potencijalnog uticaja šumskog požara 2019. godine na hemijski status reka najbližih opožarenom području.

Dobijeni rezultati ukazuju da su reke u okolini požara u okolini, osim gvožđa, dobrog hemijskog statusa (I klasa kvaliteta površinskih voda).

Visoke koncentracije Fe u Dojkinačkoj, Javorskoj i Toplodolskoj reci (reke najbliže opožarenom području) i veće koncentracije Pb, Cr, Mn i Al detektovane u Dojkinačkoj reci, u poređenju sa drugim istraživanim rekama, mogli bi da ukažu da će godinu dana nakon požara Uz prirodne procese (trošenje stena, erozija zemljišta), šumski požari imaju određeni uticaj na sadržaj ovih elemenata u rečnoj vodi.

ANALYSIS OF POLLUTANTS IN THE TARA AND ĆEHOTINA RIVERS – COMPLIANCE WITH ENVIRONMENTAL QUALITY STANDARDS

Anja Babić, Bojana Knežević

Center for Ecotoxicological Research CETI, Podgorica

Directive 2013/39/EU, transposed into the Rulebook on the Method and Deadlines for Determining the Status of Surface Waters (Official Gazette of Montenegro No. 52/19), establishes Environmental Quality Standards (EQS) for water and biota. As part of the Surface Water Monitoring Program in 2022, a comprehensive analysis of priority and specific pollutants in water, sediment, and biota samples was conducted at five locations along the Tara and Ćehotina rivers. These analyses were performed using standardized methods and advanced instrumental techniques, including GC-MS-MS, GC-MS, ICP-OES, ICP-MS, and AAS. Given the nature of these substances and their tendency to bioaccumulate, the prevention of contaminant transfer through the food chain, and ultimately, the protection of human health, the results of biota testing are significant for assessing the chemical status of surface waters. While the Directive does not define environmental quality standards for sediment, it mandates trend monitoring to provide insight into both contamination levels and background concentrations. The findings showed that the concentrations of all examined substances in the water sam-

ples were below the prescribed EQS. The levels of polycyclic aromatic hydrocarbons (PAHs) and pesticides in all biota samples were below the quantification limits of the methods used. However, the mercury content in all biota samples exceeded the EQS, and most samples also showed elevated levels of brominated diphenyl ethers (BDE). Such exceedances have been reported in numerous countries within the Danube basin

ANALIZA ZAGAĐUJUĆIH SUPSTANCI U RIJEKAMA TARI I ČEHOTINI – USKLAĐENOST SA STANDARDIMA KVALITETA ŽIVOTNE SREDINE

Anja Babić, Bojana Knežević

Centar za ekotoksikološka ispitivanja CETI, Podgorica

Pravilnik o načinu i rokovima utvrđivanja statusa površinskih voda („Službeni list Crne Gore“ br. 25/19) usklađen sa Direktivom 2013/39/EU, uspostavlja standarde kvaliteta životne sredine (SKŽS) za vodu i biotu. Kao dio Programa monitoringa površinskih voda u 2022. godini, vršena je sveobuhvatna analiza prioriternih i specifičnih zagađujućih supstanci u uzorcima vode, sedimenta i biote na pet lokacija duž rijeka Tare i Čehotine. Ove analize su izvršene korišćenjem standardnih metoda i naprednih instrumentalnih tehnika, uključujući GC-MS-MS, GC-MS, ICP-OES, ICP-MS i AAS. S obzirom na prirodu ovih supstanci i njihovu tendenciju da se bioakumuliraju, sprečavanje prenosa kontaminanata kroz lanac ishrane i, konačno, zaštitu ljudskog zdravlja, rezultati ispitivanja biote su značajni za procjenu hemijskog statusa površinskih voda. Iako Direktiva ne definiše standarde kvaliteta životne sredine za sediment, propisuje praćenje trendova kako bi se dobio uvid u nivoe zagađenja i pozadinske koncentracije. Rezultati analize su pokazali da su koncentracije svih ispitivanih supstanci u uzorcima vode bile ispod propisanih SKŽS. Nivoi policikličnih aromatičnih ugljovodonika (PAH) i pesticida u svim uzorcima biote bili su ispod granica kvantifikacije primjenjenih metoda. Međutim, sadržaj žive u svim uzorcima biote premašio je SKŽS, pri čemu je većina uzoraka takođe pokazala povišene nivoe bromovanih difenil etara (BDE). Takva prekoračenja su prijavljena u brojnim zemljama u Dunavskom slivu.

ENVIRONMENTAL IMPACT OF FARM ANIMALS - CURRENT STATE AND LEGISLATION IN MACEDONIA

Miroslav Čosevski, Ena Dobrić, Romel Velez

Department of animal hygiene and environmental protection, Faculty of veterinary medicine – Skopje, University Ss Cyril and Methodius in Skopje

Department of pharmacology and toxicology, Faculty of veterinary medicine – Skopje, University Ss Cyril and Methodius in Skopje, North Macedonia

Intensive animal husbandry and production have a very high environmental impact. Gas emissions from farms, such as methane (CH₄), carbon dioxide (CO₂), ammonia

(NH₃), and hydrogen sulfide (H₂S), are released into the atmosphere, wastewater, and soil in high concentrations. Drugs, including antibiotics administered to farm animals, are excreted into wastewater and soil, affecting the microbiome and leading to the development of new, more resistant bacterial strains, thus contributing to the growing problem of antimicrobial resistance. Macedonian legislation mandates that industrial owners, including farmers, obtain an ecological permit. This permit prescribes limit values for gas, wastewater, and soil emissions, aiming to fully regulate all environmental impacts resulting from industrial activities. Our results show that NH₃ air emissions from pig farms can reach 18.83 ppm, while ammonia emissions in wastewater can reach 150 mg/l. Although owners are obligated to comply with the established threshold values, there is a lack of continuous and comprehensive monitoring, as well as the absence of a proper methodology for establishing these threshold values. Additionally, there are rarely any precautions for the high emissions measured during monitoring. This leads us to conclude that monitoring should be done regularly and actions need to be taken when measured values exceed the limits.

UTICAJ DOMAĆIH ŽIVOTINJA NA ŽIVOTNU SREDINU - AKTUELNO STANJE I ZAKONODAVSTVO U MAKEDONIJI

Miroslav Ćosevski, Ena Dobrić, Romel Velez

Katedra za higijenu životinja i zaštitu životne sredine, Fakultet veterinarske medicine – Skoplje, Univerzitet Sv. Ćirilo i Metodije u Skoplju
Katedra za farmakologiju i toksikologiju, Fakultet veterinarske medicine – Skoplje, Univerzitet Sv. Ćirilo i Metodije u Skoplju, Severna Makedonija

Intenzivno stočarstvo i proizvodnja imaju veoma veliki uticaj na životnu sredinu. Emisije gasova sa farmi, kao što su metan (CH₄), ugljen-dioksid (CO₂), amonijak (NH₃) i vodonik sulfid (H₂S), ispuštaju se u atmosferu, otpadne vode i zemljište u visokim koncentracijama. Lekovi, uključujući antibiotike koji se daju farmским životinjama, izlučuju se u otpadne vode i zemljište, utičući na mikrobiom i dovodeći do razvoja novih, otpornijih bakterijskih sojeva, doprinoseći tako rastućem problemu otpornosti na antimikrobne lekove. Makedonsko zakonodavstvo nalaže da industrijski vlasnici, uključujući poljoprivrednike, dobiju ekološku dozvolu. Ovom dozvolom su propisane granične vrednosti emisija gasova, otpadnih voda i zemljišta, sa ciljem da se u potpunosti regulišu svi uticaji na životnu sredinu koji proizilaze iz industrijskih aktivnosti. Naši rezultati pokazuju da emisija NH₃ u vazduh sa farmi svinja može dostići 18,83 ppm, dok emisija amonijaka u otpadnim vodama može dostići 150 mg/l. Iako su vlasnici dužni da se pridržavaju utvrđenih graničnih vrednosti, postoji nedostatak kontinuiranog i sveobuhvatnog praćenja, kao i odsustvo odgovarajuće metodologije za utvrđivanje ovih graničnih vrednosti. Pored toga, retko postoje mere predostrožnosti za visoke emisije izmerene tokom monitoringa. Ovo nas navodi na zaključak da praćenje treba redovno obavljati i preduzeti radnje kada izmerene vrednosti pređu granice.

RECOGNIZABILITY IMPORTANCE OF DECARBONIZATION OF THE CONSTRUCTION SECTOR THROUGH THE ASPECT OF CLIMATE CHANGE

Ivana Šekler, Mirjana Bartula, Tanja Cupać, Vladimir Janković

Faculty of Applied Ecology Futura, University Metropolitan; Belgrade, Serbia
NGO UNEKOOP, Belgrade, Serbia

Due to the increase in the global population, and thus the rapid increase in urbanization, the needs for living space and all resources are constantly growing. The construction of new buildings should primarily provide a safe and healthy space, but also meet the criteria of sustainable development through the reduction of negative impacts on the environment and climate change that the construction sector is experiencing. It is estimated that more than a third of carbon dioxide emissions come from the construction sector, either as emissions from the process of material production and construction of buildings, or as gas emissions that occur during the operational work of the building (heat and electricity). By reducing those emissions, it would contribute to mitigating the impact on climate change, as well as the entire environment. In addition, the obligations of all signatory countries of the Green European Agreement, as well as the Green Agenda for the Western Balkans, among which Serbia is, are to significantly reduce their greenhouse gas emissions in all sectors that contribute to this. According to the Directives of the European Union, the facilities will have to meet certain criteria, all with a deadline of 2030.

This paper deals with the analysis of attitudes and recognition of the importance of decarbonization of the construction sector of the population of Serbia, giving opinions on who is most responsible for its implementation.

PREPOZNATLJIVOST ZNAČAJA DEKARBONIZACIJE GRAĐEVINSKOG SEKTORA KROZ ASPEKT KLIMATSKIH PROMENA

Ivana Šekler, Mirjana Bartula,, Tanja Cupać, Vladimir Janković

Fakultet za primenjenu ekologiju Futura, Univerzitet Metropolitan, Beograd, Srbija
NVO UNEKOOP, Beograd, Srbija

Povećanjem globalne populacije, a time i rapidnim porastom urbanizacije, potrebe za životnim prostorom ali i svim resursima konstantno rastu. Izgradnja novih objekata treba da obezbedi prvenstveno bezbedan i zdrav prostor, ali i da zadovolji kriterijume održivog razvoja kroz smanjenje negativnih uticaja na životnu sredinu i klimatske promene koji građevinski sektor beleži. Procenjeno je da više od trećine emisija ugljen-dioksida upravo dolazi iz građevinskog sektora, bilo kao emisije iz procesa proizvodnje materijala i izgradnje objekata, ili kao emisije gasova koje nastaju prilikom operativnog rada objekta (toplotna i električna energija). Redukovanjem tih emisija, doprinelo bi se ublažavanju uticaja na klimatske promene, ali i celokupnu životnu sredinu.

Osim toga, obaveze svih zemalja potpisnica Zelenog evropskog dogovora, kao i Ze-

lene agende za Zapadni Balkan, među kojima je i Srbija, jesu da značajno redukuju svoje emisije gasova sa efektom staklene bašte u svim sektorima koji tome doprinose. Objekti će, prema Direktivama Evropske unije, morati da ispunjavaju određene kriterijume, a sve sa rokom od 2030. godine.

Ovaj rad se bavi analizom stavova i prepoznavanja značaja dekarbonizacije građevinskog sektora stanovništva Srbije, dajući mišljenja o tome ko je najodgovorniji za njeno sprovođenje.

UTILIZATION OF GRASSES IN PHYTOREMEDIATION OF FLOTATION TAILINGS

Gordana Andrejić, Nikola Milanović, Snežana Brajević, Uroš Aleksić, Aleksandar Simić, Željko Dželetović, Tamara Rakić

Institute for the Application of Nuclear energy, University of Belgrade, Belgrade, Serbia

Faculty of Agriculture, University of Belgrade, Belgrade, Serbia

Faculty of Biology, University of Belgrade, Belgrade, Serbia

Mining, one of the most common forms of environmental pollution, involves the excavation and extraction of mineral raw materials for industry. Mining generates large amounts of waste material rich in potentially toxic elements (PTE), which pollutes the surrounding ecosystems. Flotation tailings are characterized by a complete lack of vegetation cover, which makes them susceptible to aeolian and fluvial erosion, and thus represent a long-term source of pollution from PTEs. Phytoremediation has recently emerged as a solution. This process is environmentally friendly and cost-effective and involves the use of plants to reduce metal toxicity through phytoextraction or immobilization. Effective phytoremediation uses fast-growing plant species that are metal-tolerant and able to colonize different environments, such as species from the *Poaceae* family. After a two-year experiment, *Miscanthus* × *giganteus* demonstrated its exceptional ability to grow under the extremely unfavorable conditions of the tailings and form a self-sustaining plant cover. Most of the metals remained in the roots, preventing their further transport and negative effects on various foliar processes. The results for *M. × giganteus* and the preliminary findings for *Arundo donax* indicate that these species are suitable for phytoremediation of such sites. This represents a significant and economically viable option for the gradual removal of metals and the reduction of their bioavailability, while producing biomass as a raw material for various uses. Further studies indicate that *Festuca rubra* and *F. arundinacea* can also be used for phytoremediation. Although further research is needed, the results indicate that the addition of mineral and organic fertilizers can reduce the accumulation of PTE in the below- and above-ground parts of plants, which has a positive effect on their growth and long-term survival at the site.

PRIMENA TRAVA U FITOREMEDIJACIJI ODLAGALIŠTA FLOTACIONE JALOVINE

Gordana Andrejić, Nikola Milanović, Snežana Brajević, Uroš Aleksić, Aleksandar Simić, Željko Dželetović, Tamara Rakić

Institut za primenu nuklearne energije, Univerzitet u Beogradu, Beograd, Srbija
Poljoprivredni fakultet, Univerzitet u Beogradu, Beograd, Srbija
Biološki fakultet, Univerzitet u Beogradu, Beograd, Srbija

Rudarstvo, jedan od najčešćih zagađivača životne sredine, obuhvata iskopavanje i ekstrakciju mineralnih sirovina koje se koriste u privredi. Rudarske aktivnosti proizvode velike količine jalovine bogate potencijalno toksičnim elementima (PTE), koja predstavlja izvor zagađenja okolnih ekosistema. Odlagališta flotacione jalovine se odlikuju potpunim odsustvom vegetacijskog pokrivača, podložna su eolskoj i fluvijalnoj eroziji, te predstavljaju dugotrajan izvor zagađenja PTE. Fitoremedijacija se nedavno pojavila kao rešenje. Ovaj proces je ekološki prihvatljiv, isplativ i podrazumeva upotrebu biljaka za smanjenje toksičnosti metala kroz njihovu fitoekstrakciju ili imobilizaciju. Za efikasnu fitoremedijaciju se koriste brzorastuće biljne vrste, tolerantne na metale i sposobne nastanjuju različita staništa, poput vrsta iz familije *Poaceae*. Nakon dvogodišnjeg oglada, *Miscanthus × giganteus* je pokazao izuzetnu sposobnost da raste u ekstremno nepovoljnim uslovima koji vladaju na odlagalištu, kao i da formira samoodrživi biljni pokrivač. Najveći deo metala se zadržao unutar korena i donekle je sprečen njihov dalji transport, a time i njihov negativni uticaj na različite procese u listovima. Dobijeni rezultati za *M. × giganteus* i preliminarni rezultati za *Arundo donax* ukazuju da su ove vrste podesne za fitoremedijaciju ovakvih odlagališta. Ovo predstavlja značajnu i ekonomski izvodljivu opciju za postepeno uklanjanje metala i smanjenje njihove biodostupnosti, uz istovremenu proizvodnju biomase kao sirovine za različite namene. Dodatna istraživanja pokazuju da se *Festuca rubra* i *F. arundinacea* takođe mogu koristiti za fitoremedijaciju. Iako su potrebna dalja istraživanja, rezultati ukazuju da dodavanje mineralnih i organskih đubriva može umanjiti akumulaciju PTE u podzemne i nadzemne delove biljaka i tako pozitivno uticati na njihov rast i dugoročan opstanak na odlagalištu.

REMOVAL OF CADMIUM IONS FROM MINE ACID WATERS USING LIMESTONE MATERIAL

Bojana Knežević, Vlatko Kastratović

Centre for Ecotoxicological Research Podgorica, Montenegro
Faculty of Natural Sciences and Mathematics, University of Montenegro

In accordance with the Regulation on the Method and Deadlines for Determining the Status of Surface Waters ("Official Gazette of Montenegro" No. 25/19), cadmium and its compounds are recognized as priority substances. Waters discharged from the old lead and zinc mine shafts of Šuplja Stijena (Šula, Pljevlja, Montenegro) contain cadmium concentrations that exceed the prescribed limits for surface waters. This study examines the potential use of limestone material, a by-product of the open-pit mining process, to reduce cadmium concentrations. The results indicate that the limestone material can adsorb cadmium ions from aqueous solutions, but the efficiency and adsorption capacity are significantly lower in multi-component systems. This is

particularly evident when testing real samples of acidic mine water, compared to tests on single-component model solutions.

UKLANJANJE JONA KADMIJUMA IZ RUDNIČKIH KISELIH VODA PRIMENOM KREČNJAČKOG MATERIJALA

Bojana Knežević, Vlatko Kastratović

Centar za ekotoksikološka ispitivanja Podgorica, Crna Gora
Prirodno-matematički fakultet, Univerzitet Crne Gore, Crna Gora

Prema Pravilniku o načinu i rokovima utvrđivanja statusa površinskih voda („Službeni list Crne Gore“ br. 25/19), kadmijum i njegova jedinjenja su prepoznati kao prioritetne supstance. Vode koje izlaze iz starih rudničkih jama rudnika olova i cinka Šuplja Stijena (Šula, Pljevlja, Crna Gora) sadrže koncentracije kadmijuma koje prelaze propisane granične vrijednosti za površinske vode. Ovaj rad istražuje mogućnost primjene krečnjačkog materijala, nusproizvoda iz procesa otvaranja površinskog kopa, u svrhu smanjenja koncentracije kadmijuma. Rezultati pokazuju da krečnjački materijal može adsorbovati jone kadmijuma iz vodenih rastvora, ali da su efikasnost i kapacitet adsorpcije značajno smanjeni u višekomponentnim sistemima. To je posebno izraženo pri ispitivanju realnih uzoraka rudničkih kiselih voda, u poređenju s ispitivanjima na jednokomponentnim modelnim rastvorima.

Impact of pesticides and drugs
on the environment
Uticaj pesticida i lekova na
životnu sredinu

OLD PESTICIDES, NEW EFFECTS - AN EXAMPLE OF ANTICOAGULANT RODENTICIDES

M. Kataranovski, I. Mirkov, A. Popov Aleksandrov, D. Kataranovski

Department of Ecology, Institute for Biological Research "Siniša Stanković" - National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia

One of the most widely used approach in pest rodents (rats, mice and voles) management is chemical method based on the use of anticoagulant rodenticides (AR). Poisoning of numerous free-living non-target species (ranging from invertebrates to mammals), AR contamination of terrestrial and aquatic food webs and exposure of humans have led to recognition of these agents as dangerous environmental contaminants, raising awareness of environmental risks they pose. In this regard, authorization of AR as biocidal products by Biocidal Products Regulation in the EU is subject to strict risk mitigation measures. Antagonism with vitamin K (VK) and interference with blood clotting with resulting hemorrhage are basic markers of AR toxicity. Our research has shown that AR may affect other physiological processes as well, implying much broader effects of AR. In this work we conducted a survey of up-to-date known cellular and molecular mechanisms of sub-lethal/asymptomatic AR effects gained from field, experimental and clinical research, as well as "omics" and predictive approaches employed in search for AR potential toxicity. This review pointed out coagulant-independent AR toxicity to cells and tissues which is related to 1. proteins not involved in the coagulation process, but require VK for their synthesis, 2. direct AR toxicity, as well as 3. toxicity associated with pro-oxidant and proinflammatory AR activity. Perceiving these AR effects may help regulators and natural resource managers in better hazard characterization and identification of potential ecotoxicological risks associated with these chemical agents, and their safer use in the end.

STARI PESTICIDI, NOVI EFEKTI – PRIMER ANTIKOAGULANTNIH RODENTICIDA

M. Kataranovski, I. Mirkov, A. Popov Aleksandrov, D. Kataranovski

Departman za ekologiju, Institut za biološka istraživanja „Siniša Stanković”- Nacionalni institut Republike Srbije, Univerzitet u Beogradu, Beograd, Srbija

Jedan od najčešće korišćenih pristupa u borbi protiv štetočina glodara (pacova, miševa i voluharica) je hemijska metoda zasnovana na upotrebi antikoagulansnih rodenticida (AR). Trovanje brojnih slobodnoživućih neciljnih vrsta (od beskičmenjaka do sisara), AR kontaminacija kopnenih i vodenih mreža hrane i izloženost ljudi doveli su do prepoznavanja ovih agenasa kao opasnih zagađivača životne sredine, podižući svest o ekološkim rizicima koje predstavljaju. U tom smislu, odobrenje AR kao biocidnog proizvoda prema Uredbi o biocidnim proizvodima u EU podleže strogim merama za smanjenje rizika. Antagonizam sa vitaminom K (VK) i ometanje zgrušavanja krvi sa rezultujućim krvarenjem su osnovni markeri AR toksičnosti. Naše istraživanje je pokazalo da AR može uticati i na druge fiziološke procese, što implicira mnogo

šire efekte AR. U ovom radu sprovedi smo istraživanje najnovijih poznatih ćelijskih i molekularnih mehanizama subletalnih/asimptomatskih AR efekata dobijenih iz terenskih, eksperimentalnih i kliničkih istraživanja, kao i „omičkih“ i prediktivnih pristupa koji se koriste u potrazi za potencijalom AR. toksičnost. Ovaj pregled je ukazao na AR toksičnost nezavisnu od koagulansa za ćelije i tkiva koja se odnosi na 1. proteine koji nisu uključeni u proces koagulacije, ali zahtevaju VK za njihovu sintezu, 2. direktnu AR toksičnost, kao i 3. toksičnost povezanu sa pro- oksidativna i proinflamatorna AR aktivnost. Uočavanje ovih efekata AR može pomoći regulatorima i menadžerima prirodnih resursa u boljoj karakterizaciji opasnosti i identifikaciji potencijalnih ekotoksikoloških rizika povezanih sa ovim hemijskim agensima, kao i njihovoj bezbednijoj upotrebi na kraju.

ECOTOXICOLOGICAL PROPERTIES OF THE DISINFECTANTS, INSECTICIDES AND RODENTICIDES AND THEIR ROLE IN EMERGENCY SITUATIONS

Silvestra Kobal, Martin Dobeic

Faculty of Veterinary medicine, Ljubljana, Slovenia

Disinfectants, insecticides and rodenticides (DDD-agents) are classified as biocides. Thus, their impact on environment, aquatic and terrestrial wild animals, domestic animals and human must be considered during the use of these compounds in public health and agriculture. According to UNEP (United Nations Environment Program) reports from 1992 biocides are among the most studied chemicals in terms of their toxicity. Biocides must be effective in target organisms however they should not act on other plants, animals and humans. The selective toxicity of biocides is extremely important feature, but unfortunately many of them do not work only on the target organisms, but also on the non-target animals and plants in the environment.

EKOTOKSIKOLOŠKE OSOBINE SREDSTAVA ZA DEZINFEKCIJU, DEZINSEKCIJU I DERATIZACIJU I NJIHOV ZNAČAJ U VANREDNIM SITUACIJAMA

Silvestra Kobal, Martin Dobeic

Fakultet veterinarske medicine, Ljubljana, Slovenija

Sredstva za dezinfekciju, dezinsekciju i deratizaciju (DDD) spadaju u biocidne, koji za svoj položaj na tržištu a time i za mogućnost praktične upotrebe na području javnog zdravlja i zdravstvene zaštite životinja moraju imati osobine koje su prihvatljive što se tiče njihovog uticaj na prirodu, divlje životinje na kopnu i organizme u vodi, ptice, koristne insekte (pčele), domaće životinje i čoveka. Po podacima UNEP (Međunarodni program Ujedinjenih nacija za prirodu) iz 1992 godine biocidi spadaju u najbolje proučene hemikalije u smislu njihove toksičnosti. Biocidi moraju biti biotično efikasni a istovremeno bezbedni za koristne biljke, životinje i čoveka. Selektivna toksičnost

biocida je njihova izuzetno važna osobina, ali nažalost mnogi od njih ne deluju samo na ciljne organizme, nego i na ne ciljne životinjske i biljne vrste u prirodi .

U radu su prikazani elementi vezani na toksikološke i ekotoksikološke osobine nekih predstavnika DDD sredstava koje moramo poznavati i poštovati, kako bi sprečili štetne posledice DDD sredstava na životnu sredinu u kojoj je došlo do vanredne situacije i masovne kontaminacije tim sredstvima.

THE IMPACT OF DISINFECTANTS, WHICH ARE USED TO DISINFECT ANIMALS AND MAINTAIN HYGIENE ON FARMS, ON THE ENVIRONMENT

Romel Velev, Miroslav Čosevski, Ena Dobrić, Dejana Čupić Miladinović

Department of pharmacology and toxicology, Faculty of veterinary medicine – Skopje, University Ss Cyril and Methodius in Skopje, R. N. Macedonia
Department of animal hygiene and environmental protection, Faculty of veterinary medicine – Skopje, University Ss Cyril and Methodius in Skopje, R. N. Macedonia
Department of anatomy, Faculty of Veterinary Medicine, University of Belgrade, R. Serbia

It is the duty of the veterinary profession to take measures to protect the health of animals and increase their production, while taking into account the well-being of the human environment. Disinfectants are an important weapon in intensive animal production. They are vital in the fight against animal diseases and in the control and eradication of major disease outbreaks. Their function is to kill and prevent the growth of microorganisms. But under certain circumstances, they are also potentially harmful substances that can have a negative impact on the environment. There is cause for concern because of the possible cumulative effects on the environment as well as the risks to human health associated with the routine use of disinfectants. In the routine use of these agents, especially in daily farm operations, there is a lack of understanding of the post-application destination of these chemicals. Disinfection products and detergents used on the farm can be found in animal products and thus in the human food chain. It is therefore important to consider the use of disinfectants in animal production that may pose a risk to the environment. This paper reviews the current state of the understanding of the impact of disinfectants to the environment and synthesizes the available information on the fate, transport and effects of disinfectants in the environment.

UTICAJ DEZINFEKCIONIH SREDSTAVA, KOJI SE KORISTE ZA DEZINFEKCIJU ŽIVOTINJA I ODRŽAVANJE HIGIJENE NA FARMAMA NA ŽIVOTNU SREDINU

Romel Velev, Miroslav Čosevski, Ena Dobrić, Dejana Čupić Miladinović

Katedra za farmakologiju i toksikologiju, Fakultet veterinarske medicine – Skoplje, Univerzitet Sv. Ćirilo i Metodije u Skoplju, Severna Makedonija
Katedra za higijenu životinja i zaštitu životne sredine, Fakultet veterinarske medicine – Skoplje, Univerzitet Sv. Ćirilo i Metodije u Skoplju, Severna Makedonija

Katedra za anatomiju, Fakultet veterinarske medicine, Univerziteta u Beogradu, R. Srbija

Dužnost veterinarske struke je da preduzima mere za zaštitu zdravlja životinja i povećanje njihove proizvodnje, vodeći računa o dobrobiti čovekove sredine. Sredstva za dezinfekciju su važno oružje u intenzivnoj stočarskoj proizvodnji. Oni su od vitalnog značaja u borbi protiv bolesti životinja i u kontroli i iskorenjivanju velikih epidemija. Njihova funkcija je ubijanje i sprečavanje rasta mikroorganizama. Ali pod određenim okolnostima, oni su i potencijalno štetne supstance koje mogu imati negativan uticaj na životnu sredinu. Postoji razlog za zabrinutost zbog mogućih kumulativnih efekata na životnu sredinu, kao i rizika po zdravlje ljudi povezanih sa rutinskom upotrebom dezinfekcionih sredstava. U rutinskoj upotrebi ovih agenasa, posebno u svakodnevnim operacijama na farmi, postoji nedostatak razumevanja odredišta ovih hemikalija nakon primene. Proizvodi za dezinfekciju i deterdženti koji se koriste na farmi mogu se naći u životinjskim proizvodima, a samim tim i u lancu ishrane ljudi. Stoga je važno razmotriti upotrebu dezinfekcionih sredstava u stočarskoj proizvodnji koja mogu predstavljati rizik za životnu sredinu. U ovom radu se daje pregled trenutnog stanja razumevanja uticaja dezinfekcionih sredstava na životnu sredinu i sintetizuju dostupne informacije o sudbini, transportu i dejstvu dezinfekcionih sredstava u životnoj sredini.

IMPACT OF INSECTICIDES ON THE ENVIRONMENT AND ENVIRONMENTALLY ACCEPTABLE REMEDIATION MEASURES

Vitomir Čupić, Mirjana Bartula, Svetozar Krstić, Silva Dobrić, Saša Vasilev

Faculty of Applied Ecology Futura, Metropolitan University, Republic of Serbia
Faculty of Medicine, Military Medical Academy, University of Defense, Belgrade, Serbia

Institute for the Application of Nuclear Energy, INEP, Zemun, Republic of Serbia

In the protection of people, animals and plants from numerous insects or ectoparasites, insecticides have played a very important role since their introduction until today. Thanks to the application of these means, various infectious diseases were eradicated, the suppression and treatment of ectoparasitosis in humans and animals was facilitated, and agricultural production was improved and increased. Although great results have been achieved in the fight against infectious diseases, unfortunately there are still certain regions in the world where some infectious diseases (malaria) claim a large number of human lives.

Insecticides (as already mentioned) contributed significantly to the increase in agricultural production. That is why today you can often hear the opinion that agricultural production has become practically impossible without the use of pesticides. This certainly influenced the fact that these funds are used massively all over the world today. The facts just mentioned, i.e. this kind of application of insecticides, which is often irrational, is causing increasing concern. One of the most important reasons for this is certainly the increase in the development of resistance in insects, and thus the decrease in the effectiveness of insecticides. In addition, the growing pollution of the

environment is of no less importance. This has also been talked about more and more recently in our country, so more care will have to be taken in the future. This is primarily due to the fact that the application of insecticides (especially if it is irrational) can have a harmful effect, not only on non-target, that is, beneficial insects, such as bees, but also on other organisms, especially those in the soil and water. If we add to this the fact that potential contamination of the food chain can occur, then these are certainly factors that can lead to a disturbance of the balance in certain ecosystems. The aim of this paper is to point out the possible harms of irrational application of insecticides, to emphasize the importance of reasonable application of insecticides and to propose measures for its application.

UTICAJ INSEKTICIDA NA ŽIVOTNU SREDINU I EKOLOŠKI PRIHVATLJIVE MERE REMEDIJACIJE

Vitomir Ćupić, Mirjana Bartula, Svetozar Krstić, Silva Dobrić, Saša Vasilev

Fakultet za primenjenu ekologiju Futura, Univerzitet Metropolitan, Republika Srbija
Medicinski fakultet Vojnomedicinske akademije, Univerzitet odbrane, Beograd, Srbija
Institut za primenu nuklearne energije, INEP, Zemun, Republika Srbija

U zaštiti ljudi, životinja i biljaka od brojnih insekata ili ektoparazita insekticidi su od samog uvođenja, pa do danas odigrali veoma značajnu ulogu. Zahvaljujući primeni ovih sredstava iskorenjene su razne zarazne bolesti, olakšano je suzbijanje i lečenje ektoparazitoza kod ljudi i životinja, te je unapređena i povećana poljoprivredna proizvodnja. Iako su postignuti, (može se slobodno reći) grandiozni rezultati u suzbijanju zaraznih bolesti, nažalost još uvek postoje određeni regioni u svetu, gde neke zarazne bolesti (malarija) odnose veliki broj ljudskih života.

Insekticidi su (kao što je već rečeno) značajno doprineli i povećanju poljoprivredne proizvodnje. Zbog toga se danas često može čuti mišljenje da je poljoprivredna proizvodnja postala praktično nemoguća bez primene pesticida. To je svakako uticalo da se ova sredstva danas, takoreći masovno koriste širom sveta.

Upravo navedene činjenice, odnosno ovakva primena insekticida, koja je često i neracionalna, izaziva sve veću zabrinutost. Jedan od najvažnijih razloga za to, jeste svakako porast razvoja rezistencije kod insekata, a time i smanjenje efikasnosti insekticida. Pored toga, ne manji značaj ima i sve veće zagađenje životne sredine. O tome se takođe u poslednje vreme sve više priča i u našoj zemlji, pa će se u budućnosti morati voditi više računa. Ovo pre svega iz razloga, što primena insekticida (naročito ukoliko je neracionalna) može delovati štetno, ne samo na neciljne, odnosno korisne insekte, kao što su pčele, već i druge organizme, a posebno one u zemljištu i vodi. Ako se ovom doda i činjenica da može nastati i potencijalna kontaminacija lanca ishrane, onda su to svakako faktori koji mogu dovesti do poremećaja ravnoteže u pojedinim ekosistemima.

Cilj ovog rada je upravo da ukaže na moguće štete neracionalne primene insekticida, da se istakne značaj razumne primene insekticida i predlože mere za njenu primenu.

ECOPHARMACOVIGILANCE - THE WAY TO PROTECT THE ENVIRONMENT FROM THE HARMFUL EFFECTS OF DRUGS

Silva Dobrić, Vitomir Ćupić

Faculty of Medicine, Military Medical Academy, Defense University, Belgrade, Serbia

Faculty of Applied Ecology "Futura", Metropolitan University, Belgrade, Serbia

Today, a drug has entered all aspects of human life, starting from birth control, through prevention, diagnosis and treatment of diseases, and finally to the impact on the environment. Today, the problem of environmental pollution with drugs is given special attention because it is evident that their use in human and veterinary medicine is progressively increasing day by day. According to some estimates, around 100,000 tons of antimicrobial drugs are used in the world every year, while e.g. more than 30 billion doses of non-steroidal anti-inflammatory drugs are consumed in the US alone. In recent years, more and more different drugs have been detected in the environment, many of which have been found to have a negative impact on numerous animal species with a consequent disturbance of the balance in the living world. There is a well-known case of a large plague of vultures on the Indian subcontinent after consuming the carcasses of animals treated with diclofenac, feminization of male fish under the influence of ethinyl estradiol, sterility of frogs caused by progesterone, development of bacterial resistance due to the large presence of antimicrobial drugs in the environment, etc. The perceived problems led to the development of ecopharmacovigilance, a new scientific discipline that deals with the detection, assessment, understanding and prevention of adverse effects and other problems in the environment caused by drugs. The result of the work of experts in the field of pharmacovigilance is reflected in the undertaking of a series of corrective measures aimed at reducing the amount of drugs that reach the environment, increasing the efficiency of wastewater treatment plants, synthesizing a greater number of safer medicinal substances (the concept of ecopharmacology), developing a program for better disposal of pharmaceutical waste and to help regulatory bodies in the drafting of legal acts governing that area.

Thanks to ecopharmacovigilance, today drugs are not only viewed through their role in protecting and improving human and animal health, but also through protecting the environment from their potentially harmful effects.

EKOFARMAKOVIGILANCA – PUT KA OČUVANJU ŽIVOTNE SREDINE OD ŠTETNIH UTICAJA LEKOVA

Silva Dobrić, Vitomir Ćupić

Medicinski fakultet Vojnomedicinske akademije, Univerzitet odbrane, Beograd, Srbija

Fakultet za primenjenu ekologiju "Futura", Univerzitet Metropolitan, Beograd, Srbija
Lek je danas ušao u sve aspekte života čoveka, počevši od kontrole rađanja, preko prevencije, dijagnostike i lečenja bolesti, pa sve do uticaja na životnu sredinu. Da-

nas se problemu zagađanja životne sredine lekovima poklanja posebna pažnja jer je evidentno da se njihova upotreba u humanoj i veterinarskoj medicini progresivno povećava iz dana u dan. Prema nekim procenama, u svetu se svake godine upotrebi oko 100.000 tona antimikrobnih lekova, dok se npr. samo u SAD potroši više od 30 milijardi doza nesteroidnih antiinflamatornih lekova. Poslednjih godina se sve više različitih lekova detektuje u životnoj sredini, od kojih je za mnoge ustanovljen negativni uticaj na brojne životinjske vrste s posledničnim poremećajem ravnoteže u živom svetu. Poznat je slučaj velikog pomora lešinara na Indijskom potkontinentu nakon konzumiranja leševa životinja tretiranih diklofenakom, feminizacija mužjaka riba pod dejstvom etinil estradiola, sterilitet žaba izazvan progesteronom, razvoj bakterijske rezistencije zbog velikog prisustva antimikrobnih lekova u životnoj sredini, itd. Uočeni problemi doveli su do razvoja ekofarmakovigilance, nove naučne discipline koja se bavi otkrivanjem, procenom, razumevanjem i prevencijom štetnih efekata i drugih problema u životnoj sredini izazvanih lekovima. Rezultat rada stručnjaka u oblasti farmakovigilance ogleda se u preduzemanju niza korektivnih mera u cilju smanjenja količine lekova koje dospevaju u životnu sredinu, povećanja efikasnosti postrojenja za prečišćavanje otpadnih voda, sinteze većeg broja bezbednijih lekovitih supstancija (koncept ekofarmakologije), razvoja programa boljeg odlaganja farmaceutske otpada i pomoći regulatornim telima u izradi zakonskih akata kojima se uređuje ta oblast. Zahvaljujući ekofarmakovigilanci danas se na lekove ne gleda samo kroz njihovu ulogu u zaštiti i unapređenje zdravlja čoveka i životinja, već i kroz zaštitu životne sredine od njihovih potencijalno štetnih efekata.

Economic, technical, technological and
legal aspects of environmental protection
(EU standards)

Ekonomski, tehnički, tehnološki i pravni
aspekti zaštite životne sredine
(EU standardi)

THE EUROPEAN LEGAL FRAMEWORK FOR SUSTAINABLE WASTE MANAGEMENT

Biljana Činčurak Erceg

Josip Juraj Strossmayer University of Osijek, Faculty of Law Osijek, Croatia

The amount of produced waste as well as its inappropriate disposal is a global problem. Waste management is aimed at preventing the generation of waste and reducing its harmful impact on the environment. However, waste is not garbage and it can be a valuable raw material for further production. In order to reduce the amount of waste and reduce its harmful impact on the environment, the European Union has set ambitious goals for the realization of which it has adopted a number of different documents and rules. In addition to the Waste Framework Directive, the legal framework includes a whole series of directives related to: waste batteries and accumulators, waste from vehicles, landfill waste, on waste management from extractive industries, packaging and packaging waste, the use of sludge from wastewater treatment plants in agriculture, waste electrical and electronic equipment.

The circular economy is a model of production and consumption that includes sharing, renting, reusing, repairing, restoring and recycling existing materials and products, which aims to reduce the amount of waste to a minimum. In this way, the circular economy tackles climate change and other global environmental problems. The goal of European Union policies is to contribute to the circular economy by extracting resources from waste.

The paper analyses the most important provisions of the Waste Framework Directive (which sets the basic concepts and definitions related to waste management) and other relevant regulations. Although there is a legal framework for waste, the implementation of the directives in the EU member states differs significantly. The difference between the set goals and the results achieved so far is also visible.

The environmental goals of the European Union are ambitious, and their realization is necessary, and it is necessary to invest additional efforts in their realization, and the adoption of new legal rules will certainly be necessary.

EVROPSKI PRAVNI OKVIR ZA ODRŽIVO UPRAVLJANJE OTPADOM

Biljana Činčurak Erceg

Sveučilište Josipa Jurja Strossmayera u Osijeku, Pravni fakultet Osijek, R. Hrvatska

Količina proizvedenog otpada kao i njegovo neodgovarajuće zbrinjavanje globalni su problem. Upravljanje otpadom usmereno je na sprečavanje nastanka otpada i smanjivanje njegovog štetnog uticaja na životnu sredinu. Međutim, otpad nije smeće i on može biti vredna sirovina za daljnju proizvodnju. Kako bi se smanjila količina otpada te smanjio njegov štetni uticaj na životnu sredinu, Evropska unija je postavila ambiciozne ciljeve za čije je ostvarivanje donela niz različitih dokumenata i pravila.

Uz Okvirnu direktivu o otpadu, zakonski okvir obuhvata i čitav niz direktiva koje se odnose na: otpadne baterije i akumulatore, otpadna vozila, deponije otpada, upravljanje otpadom iz industrijske ekstrakcije minerala, ambalažu i ambalažni otpad, upotrebu mulja iz postrojenja za prečišćavanje otpadnih voda u poljoprivredi, otpad električne i elektroničke opreme.

Cirkularna ekonomija je model proizvodnje i potrošnje koji uključuje deljenje, ponovnu upotrebu, popravku, obnavljanje i reciklažu postojećih materijala i proizvoda čime se količina otpada želi smanjiti na minimum. Na taj način cirkularna ekonomija utiče i na klimatske promene i druge globalne ekološke probleme. Cilj politika Evropske unije je da izdvajanjem resursa iz otpada doprinese kružnom gospodarstvu.

U radu se analiziraju najvažnije odredbe Okvirne direktive o otpadu (koja postavlja osnovne koncepte i definicije vezane za upravljanje otpadom) i ostalih relevantnih propisa. Iako postoji pravni okvir za otpad, primena direktiva u državama članicama Evropske unije značajno se razlikuje. Vidljiva je i razlika između postavljenih ciljeva i do sada ostvarenih rezultata.

Ekološki ciljevi Evropske unije su ambiciozni, a njihova realizacija je neophodna te je potrebno uložiti dodatne napore u njihovo ostvarivanje, a donošenje novih pravnih pravila svakako će biti nužno.

FISCAL ENVIRONMENTAL PROTECTION POLICY AND ENVIRONMENTAL TAXES

Renata Perić, Emina Jerković

Josip Juraj Strossmayer University of Osijek, Faculty of Law Osijek, Croatia

Fifty years ago, pollution problems were much less serious than today, when they pose a serious threat to people's health, not to mention concern for future generations. It seems that the time has come for a green tax reform, but while the literature is already well equipped with theoretical results, more empirical research is needed, especially in some developing countries, such as the Republic of Croatia.

The issue of environmental protection transcends national borders and has no national affiliation. Considering the number of countries that are interested in solving them, we see the problems as bilateral (between two neighboring countries), multilateral (where a larger number of countries that are not necessarily neighboring countries participate) and global. Environmental taxes are one of the ways to solve them. The founding of the modern European community of states shed light on the problems that the EU must deal with, but also new possibilities and policies for environmental protection and sustainable development and general environmental management.

It is the primary responsibility of each member state of the European Union to regulate its own environmental policy, but the European supranational common policy determines the direction in which it must move and harmonize its own regulations with the European ones.

It is a big drawback that despite the implemented environmental tax reforms, by strengthening the pressure of European legislation on EU member states towards

stronger taxation of production, products and services harmful to the environment and human health, no significant increase in income from environmental taxes was achieved.

FISKALNA POLITIKA ZAŠTITE OKOLIŠA I EKOLOŠKI POREZI

Renata Perić, Emina Jerković

Sveučilište Josipa Jurja Strossmayera u Osijeku, Pravni fakultet Osijek, R. Hrvatska

Pre pedeset godina, problemi zagađenja bili su mnogo manje ozbiljni nego danas, kada predstavljaju ozbiljnu pretnju po zdravlje ljudi, a da ne govorimo o brizi za buduće generacije. Čini se da je došlo vreme za zelenu poresku reformu, ali dok je literatura već dobro opremljena teorijskim rezultatima, potrebno je više empirijskih istraživanja, posebno u nekim zemljama u razvoju, kao što je Republika Hrvatska.

Pitanje zaštite životne sredine prevazilazi nacionalne granice i nema nacionalno opredeljenje. S obzirom na broj zemalja koje su zainteresovane za njihovo rešavanje, probleme vidimo kao bilateralne (između dve susedne zemlje), multilateralne (gde učestvuje veći broj zemalja koje nisu nužno susedne) i globalne. Porezi na životnu sredinu su jedan od načina da se oni reše. Osnivanje moderne Evropske zajednice država rasvetlilo je probleme sa kojima se Evropska unija suočava, ali i nove mogućnosti i politike zaštite životne sredine i održivog razvoja i opšteg upravljanja životnom sredinom.

Primarna je odgovornost svake države članice Evropske unije da reguliše sopstvenu politiku zaštite životne sredine, ali evropska nadnacionalna zajednička politika određuje pravac u kome ona mora da se kreće i usklađuje sopstvene propise sa evropskim.

Velika je mana što uprkos sprovedenim reformama ekološkog poreza, jačanju pritiska evropskog zakonodavstva na članice Evropske unije ka većem oporezivanju proizvodnje, proizvoda i usluga štetnih po životnu sredinu i zdravlje ljudi, nije došlo do značajnijeg povećanja prihoda od ekološke porezi.

ACHIEVING RESILIENCE: SUSTAINABLE WATERSHED MANAGEMENT IN MONTENEGRO'S DANUBE RIVER BASINS

Velibor Spalević

Biotechnical Faculty, University of Montenegro, Podgorica, Montenegro

Montenegro's pursuit of sustainable resource management in the Danube River Basins, focusing on water and soils, is pivotal among evolving environmental and economic landscapes. The nation confronts two critical imperatives: aligning with EU standards and bolstering local capacities for effective governance. Key challenges include addressing water scarcity, combatting soil degradation, and fortifying legislative frameworks. While Montenegro's current legal infrastructure serves as a

foundation, there is a pressing need to strengthen it through comprehensive strategies such as River Basin Management Plans and a National Environmental Approximation Strategy. Establishing robust soil monitoring and modeling administrations is strongly recommended to enhance Montenegro's ability to manage its soils sustainably. These initiatives align with broader European goals, aiming to ensure environmental sustainability, foster economic resilience, and adhere to international norms. This presentation aims to spotlight Montenegro's strategic initiatives and the obstacles it faces in managing soil and water resources within the Danube River Basins. It underscores the importance of aligning legislation with EU standards, implementing holistic management plans, and advancing capacity-building efforts to achieve sustainable resource management goals.

POSTIZANJE OTPORNOSTI: ODRŽIVO UPRAVLJANJE SLIVOVIMA DUNAVSKOG BASENA CRNE GORE

Velibor Spalević

Biotehnički fakultet, Univerzitet Crne Gore, Podgorica, Crna Gora

Crna Gora aktivno teži održivom upravljanju resursima u Dunavskim slivovima, fokusirajući se na pitanja voda i zemljišta usred evoluirajućih ekoloških i ekonomskih pitanja. Struka se suočava sa dva ključna imperativa: usklađivanjem sa standardima EU i jačanjem lokalnih kapaciteta za efikasno upravljanje. Ključni izazovi uključuju rješavanje problema nestašice vode, borbu protiv degradacije zemljišta i jačanje zakonodavnih okvira. Dok trenutna pravna infrastruktura Crne Gore služi kao temelj, postoji hitna potreba da se ojača kroz sveobuhvatne strategije poput planova upravljanja slivovima rijeka i Nacionalne strategije za aproksimaciju u oblasti zaštite životne sredine. Snažno se preporučuje uspostavljanje robustnih administracija za praćenje i modeliranje zemljišta kako bi se unaprijedila sposobnost Crne Gore da održivo upravlja svojim zemljištima. Ove inicijative se uklapaju u šire evropske ciljeve, težeći osiguravanju ekološke održivosti, podsticanju ekonomske otpornosti i poštovanju međunarodnih normi. Ovaj rad ima za cilj da istakne strateške inicijative Crne Gore i prepreke s kojima se suočava u upravljanju resursima zemljišta i vode u Dunavskim slivovima. Ističe se važnost usklađivanja zakonodavstva sa standardima EU, implementacije integrisanih planova upravljanja i unapređenja napora za izgradnju kapaciteta radi postizanja ciljeva održivog upravljanja resursima.

GREEN TRANSPORT AGENDA - MYTH OR ACHIEVABLE GOAL

Aleksandra Vasilj

Josip Juraj Strossmayer University of Osijek, Faculty of Law Osijek, Croatia

Traffic is the main environmental pressure in the European Union, contributing to climate change, air pollution, and noise. It is responsible for 25% of all carbon dioxide

emissions in the European Union and is the only sector where an increase in the share of harmful gases has been recorded. In 2019, the European Commission introduced the European Green Deal, aiming to make Europe the first climate-neutral continent by 2050 and fulfill the commitments made under the Paris Agreement on climate change. To ensure that climate neutrality is not just a political proposal but also a legal obligation, the European Climate Law came into force in 2021. The Green Traffic Agenda in the European Union (EU) represents a comprehensive framework of policies and laws aimed at achieving sustainable mobility and reducing the negative impacts of traffic on the environment. Legal regulation plays a crucial role in achieving these goals. The paper explores key strategies and initiatives for promoting sustainable mobility and reducing the negative impacts of traffic on the environment. It examines how the implementation of green traffic agendas can contribute to achieving sustainable development goals through the analysis of relevant policies, technologies, and practices. Through a deeper understanding of barriers, potential solutions, and key stakeholders in the process, the paper seeks to provide insight into possible pathways to achieving the goals of the green traffic agenda and stimulate further discussion and action in this important area of sustainable development. Additionally, the paper analyzes the role of legal regulation in promoting sustainable transportation systems in urban areas. It explores how legal regulation supports the Green Traffic Agenda in the EU while promoting innovation, technological advancement, and socially responsible behavior in the transportation sector. This paper provides insight into the complexity of the legal framework and emphasizes the importance of continuous alignment of policies and laws with the goals of sustainable development in the transportation sector.

ZELENA PROMETNA AGENDA – MIT ILI OSTVARIV CILJ

Aleksandra Vasilj

Sveučilište Josipa Jurja Strossmayera u Osijeku, Pravni fakultet Osijek, R. Hrvatska

Saobraćaj je primarni uzrok ekološkog pritiska u Evropskoj uniji, doprinoseći klimatskim promjenama, zagađenju vazduha i buci. Odgovoran je za četvrtinu emisija ugljen-dioksida u EU i jedini sektor sa rastom štetnih gasova. Evropska komisija je 2019. predstavila Evropski zeleni plan, sa ciljem da do 2050. EU postane prvi klimatski neutralan kontinent, u skladu s Pariskim sporazumom. Kako bi se ovo ostvarilo kao pravna obaveza, 2021. je stupio na snagu Europski zakon o klimi. Zelena prometna agenda u EU obuhvata širok spektar politika i zakona usmjerenih na održivu mobilnost i smanjenje negativnih uticaja saobraćaja na životnu sredinu. Pravna regulacija igra ključnu ulogu u postizanju ovih ciljeva. Rad istražuje strategije i inicijative za promociju održive mobilnosti i smanjenje negativnih uticaja saobraćaja. Analizira se kako implementacija zelenih prometnih agendi može doprineti ostvarenju ciljeva održivog razvoja kroz analizu relevantnih politika, tehnologija i praksi. Kroz dublje razumevanje prepreka, potencijalnih rešenja i ključnih aktera, rad nastoji pružiti uvid u moguće putove ka ostvarenju ciljeva zelene prometne agende i podstaći dalju raspravu i akciju u ovom ključnom području održivog razvoja. Pored toga, analizira se uloga pravne regulacije u podsticanju održivih transportnih sistema u urbanim oblastima.

ma, istovremeno promovišući inovacije, tehnološki napredak i društveno odgovorno ponašanje u sektoru prometa. Ovaj rad pruža uvid u kompleksnost pravnog okvira te naglašava važnost kontinuiranog usklađivanja politika i zakona s ciljevima održivog razvoja u prometnom sektoru.

NAVIGATING AI AND ENVIRONMENTAL PROTECTION REGULATION: CHALLENGES IN THE EUROPEAN UNION

Dunja Duić

Faculty of Law Osijek, J. J. Strossmayer University Osijek, Croatia

This paper examines the intersection of artificial intelligence (AI) and environmental protection, focusing on the European Union's (EU) regulatory response to the technological implications of AI development. The intention is to explore how AI innovations can be harnessed to tackle environmental challenges, such as climate change, resource management, and pollution control, while ensuring data protection and cybersecurity. Although, from a regulatory perspective, the European Union has recognized the significant impact of artificial intelligence on various aspects of society and has taken proactive measures to regulate its development and use, this paper discusses the challenges and complexities of regulating artificial intelligence in the EU. It includes the alignment of legislation with the rapid pace of technological advancement, cross-border data transfers, and potential impact of the AI on environmental protection. Additionally, the paper explores the approach of the Court of Justice of the European Union issues in the context of AI usage. The paper also discusses whether existing EU legislation on AI and environmental protection is equipped with the appropriate tools to effectively address the rapid technological advancement and development of artificial intelligence.

UPRAVLJANJE AI I REGULATIVA O ZAŠTITI ŽIVOTNE SREDINE: IZAZOVI U EVROPSKOJ UNIJI

Dunja Duić

Sveučilište Josipa Jurja Strossmayera u Osijeku, Pravni fakultet Osijek, R. Hrvatska

Ovaj rad ispituje odnos veštačke inteligencije (VI) i zaštite životne sredine, fokusirajući se na regulatorni odgovor Evropske unije (EU) na tehnološke implikacije razvoja veštačke inteligencije. Namera je da se istraži kako se inovacije veštačke inteligencije mogu iskoristiti za rešavanje ekoloških izazova, kao što su klimatske promene, upravljanje resursima i kontrola zagađenja, uz obezbeđivanje zaštite podataka i sajber bezbednosti. Iako je, iz regulatorne perspektive, Evropska unija prepoznala značajan uticaj veštačke inteligencije na različite aspekte društva i preduzela proaktivne mere za regulisanje njenog razvoja i upotrebe, ovaj rad razmatra izazove i složenost

regulisanja veštačke inteligencije u EU. To uključuje usklađivanje zakonodavstva sa brzim tempom tehnološkog napretka, prekogranični prenos podataka i potencijalni uticaj veštačke inteligencije na zaštitu životne sredine. Pored toga, rad istražuje pristup pitanjima Suda pravde Evropske unije u kontekstu upotrebe veštačke inteligencije. U radu se takođe razmatra da li je postojeće zakonodavstvo EU o veštačkoj inteligenciji i zaštiti životne sredine opremljeno odgovarajućim alatima za efikasno rešavanje brzog tehnološkog napretka i razvoja veštačke inteligencije.

ECOTOURISM AS A FUNCTION OF SUSTAINABILITY

Svetozar Krstić, Vitomir Ćupić, Vladimir Krstić

Educons University, Academy of Hospitality, Tourism and Wellness; Belgrade, Serbia

Faculty of Applied Ecology "Futura", Metropolitan University, Belgrade, Serbia

Ecotourism is a form of tourism that is growing and gaining importance due to its sustainable approach, attention to nature and culture, and support to the local community. Within ecotourism, tradition plays an important role that contributes to the authenticity of tourists' experiences, the preservation of cultural identity and the promotion of local culture. The preservation and promotion of tradition within ecotourism not only enriches tourist experiences, but also contributes to the sustainable development of tourism, the protection of cultural heritage and the support of economic development, especially in rural areas. Education plays a key role in ecotourism because it provides visitors, local residents and tourism operators with knowledge, awareness and understanding of the importance of nature conservation, support for the local community, promotion of sustainable tourism and environmental protection. The creation and development of sustainable tourism products and services in ecotourism are key to promoting sustainability, protecting nature and supporting the local community. There are several notable certifications and certifications for eco-tourism that recognize and promote sustainable practices in tourism. Establishing a certification for ecotourism in Serbia, similar to that of Ecotourism Australia, requires thorough planning, cooperation with relevant stakeholders and alignment with international standards of sustainable tourism. In the paper, it is proposed to launch a project for the establishment of "Ecotourism Serbia" certification. Based on the observed facts, development documents, world trends and the situation on the ground, the authors recommend measures and activities for the improvement of eco-tourism in Serbia.

EKOTURIZAM U FUNKCIJI ODRŽIVOSTI

Svetozar Krstić, Vitomir Ćupić, Vladimir Krstić

Univerzitet Educons, Akademija za hotelijerstvo, turizam i wellnes; Beograd, Srbija
Fakultet za primenjenu ekologiju "Futura", Metropolitan Univerzitet, Beograd, Srbija

Ekoturizam predstavlja oblik turizma koji sve više raste i dobija na značaju zbog svog održivog pristupa, pažnje prema prirodi i kulturi i podrške lokalnoj zajednici.

U sklopu ekoturizma, tradicija ima važnu ulogu koja doprinosi autentičnosti iskustava turista, očuvanju kulturnog identiteta i promociji lokalne kulture. Očuvanje i promocija tradicije unutar ekoturizma ne samo što obogaćuje turistička iskustva, već i doprinosi održivom razvoju turizma, zaštiti kulturnog nasleđa i podršci ekonomskom razvoju, naročito ruralnih predela. Edukacija igra ključnu ulogu u ekoturizmu jer pruža posetiocima, lokalnom stanovništvu i turističkim operaterima znanje, svest i razumevanje o važnosti očuvanja prirode, podrške lokalnoj zajednici, promovisanju održivog turizma i zaštite okoline. Kreiranje i razvoj održivih turističkih proizvoda i usluga u ekoturizmu ključni su za promovisanje održivosti, zaštitu prirode i podršku lokalnoj zajednici. Postoji nekoliko značajnih sertifikata i certifikacija za eko turizam koje prepoznaju i promovišu održive prakse u turizmu. Uspostavljanje sertifikacije za ekoturizam u Srbiji, slične onoj Ecotourism Australia, zahteva temeljno planiranje, saradnju s relevantnim stakeholderima i usklađivanje s međunarodnim standardima održivog turizma. U radu se predlaže pokretanje projekta za uspostavljanje sertifikacije "Ekoturizam Srbija". Na osnovu sagledanih činjenica, razvojnih dokumenata, svetskih trendova i situacije na terenu, autori preporučuju mere i aktivnosti za unapređenje ekoturizma u Srbiji.

GREEN FRANCHISING – CONNECTING SUSTAINABILITY AND FRANCHISING

Aleksandar Erceg, Rita-Krin Boduljak, Ljiljana Kukec

Josip Juraj Strossmayer University of Osijek, Faculty of Economics and Business in Osijek, Croatia
Swiss School of Business Management

Green franchising means ecologically sustainable and fair franchising, including franchise companies that behave environmentally friendly. Due to the increased awareness of sustainability, ecology, and fairness, "green" is also becoming a more and more prominent topic in franchising. Green franchising aims to find balanced and sustainable economic, ecological and social solutions. Green franchising aims for franchise systems to operate sustainably and in an environmentally and socially compatible manner over the long term. Green franchising also sees the sustainability of the franchise system itself as one of the critical success factors. The binding power and duration of franchise partnerships depend on the quality of the concept and, on the other hand, essentially on the quality of the relationships.

The paper's main aim is to investigate green franchising from the research point of view and to see whether there is an opportunity for such franchise systems in Croatia. The work is based on data on the development of the green economy in the world, the unique features of green franchising, and statistical data from the International Franchise Association and the World Franchising Council on the development of green franchising. The paper will present a case study of the one Croatian franchise. Based on the research, the conclusion will offer proposals for increasing possibilities for such franchise systems.

ZELENI FRANŠIZING – POVEZIVANJE ODRŽIVOSTI I FRANŠIZINGA

Aleksandar Erceg, Rita-Krin Boduljak, Ljiljana Kukec

Sveučilište Josipa Jurja Strossmayera u Osijeku, Ekonomski fakultet u Osijeku, R.
Hrvatska

Švajcarska škola za poslovni menadžment

Zeleni franšizing znači ekološki održivi i poštteni franšizing, uključujući franšizne kompanije koje se ponašaju ekološki prihvatljivo. Zbog povećane svesti o održivosti, ekologiji i pravičnosti, „zeleno“ takođe postaje sve istaknutija tema u franšizingu. Zeleno franšizing ima za cilj pronalaženje uravnoteženih i održivih ekonomskih, ekoloških i društvenih rešenja. Zeleno franšizing ima za cilj da sistemi franšize funkcionišu održivo i na ekološki i društveno kompatibilan način na duži rok. Zeleno franšizing takođe vidi održivost samog franšiznog sistema kao jedan od kritičnih faktora uspeha. Obavezujuća snaga i trajanje franšiznog partnerstva zavise od kvaliteta koncepta i, s druge strane, suštinski od kvaliteta odnosa.

Glavni cilj rada je istražiti zeleni franšizing sa istraživačke tačke gledišta i vidjeti postoji li mogućnost za takve franšizne sisteme u Hrvatskoj. Rad se zasniva na podacima o razvoju zelene ekonomije u svetu, jedinstvenim karakteristikama zelenog franšizinga i statističkim podacima Međunarodne asocijacije za franšizing i Svetskog saveta za franšizing o razvoju zelenog franšizinga. U radu će biti predstavljena studija slučaja jedne hrvatske franšize. Na osnovu istraživanja, zaključak će ponuditi predloge za povećanje mogućnosti za ovakve franšizne sisteme.

EROSION POTENTIAL METHOD APPLICATION FOR SOIL LOSS ESTIMATION IN ALFENAS, MINAS GERAIS, BRAZIL

Bruno Aurélio Silva, Guilherme da Silva Rios, Derielsen Brandão Santana, Joaquim Ernesto Bernardes Ayer, Velibor Spalevic, Ronaldo Luiz Mincato

Undergraduate in Geography, Federal University of Alfenas, Alfenas, Brazil.
Postgraduate Program in Environmental Sciences, Federal University of Alfenas, Alfenas, Brazil

Department of Chemistry, University Center of Paulínia, Paulínia, Brazil.

Department of Geography, University of Montenegro, Podgorica, Montenegro.

Institute of Natural Sciences, Federal University of Alfenas, Alfenas, Brazil.

Soil erosion, a natural phenomenon with global impacts, is influenced by various factors, primarily climate change and land use/cover dynamics. These factors exacerbate erosion rates and increase sedimentation in reservoirs. This study applies the Erosion Potential Method (EPM) developed by Professor Gavrilovic (1972) to estimate soil loss in Alfenas, Minas Gerais, Brazil. The EPM integrates variables such as annual precipitation, temperature, and erosion intensity to calculate erosion rates. In 2023, the study area experienced substantial soil loss, totaling nearly 1,000 tons per year, averaging approximately 0.9 tons per hectare annually. Native forests exhibited minimal

erosion at 0.014 tons per hectare per year, whereas exposed soils recorded the highest rates at around 3.5 tons per hectare per year. These findings highlight the urgent need for effective erosion control strategies to preserve natural resources and sustain agricultural productivity. The study provides valuable insights for policymakers aiming to implement sustainable soil conservation and land management practices in tropical regions.

PRIMENA METODA POTENCIJALA EROZIJE NA PROCENU GUBITAKA ZEMLJIŠTA U ALFENASU, MINAS ŽERAIS, BRAZIL

Bruno Aurélio Silva, Guilherme da Silva Rios, Derielsen Brandão Santana, Joaquim Ernesto Bernardes Ayer, Velibor Spalevic, Ronaldo Luiz Mincato

Dodiplomski studij geografije, Federalni univerzitet Alfenas, Alfenas, Brazil.
Postdiplomski program iz nauka o životnoj sredini, Federalni univerzitet Alfenas, Alfenas, Brazil
Odsek za hemiju, Univerzitetski centar Paulinija, Paulinija, Brazil.
Departman za geografiju, Univerzitet Crne Gore, Podgorica, Crna Gora.
Institut prirodnih nauka, Federalni univerzitet Alfenas, Alfenas, Brazil.
er of Paulínia, Paulínia, Brazil.

Erozija zemljišta, prirodni fenomen sa globalnim uticajem, pod uticajem je različitih faktora, pre svega promena klime i dinamike korišćenja/pokrovnosti zemljišta. Ovi faktori ubrzavaju stope erozije i povećavaju taloženje sedimenta u rezervoarima. Ova studija primenjuje Metod potencijala erozije (EPM) razvijen od strane profesora Gavrilovića (1972) za procenu gubitaka zemljišta u Alfenasu, Minas Žerais, Brazil. EPM integriše varijable kao što su godišnja količina padavina, temperatura i intenzitet erozije za izračunavanje stopa erozije. U 2023. godini, istraživano područje je doživelo značajan gubitak zemljišta, ukupno gotovo 1.000 tona godišnje, prosečno oko 0,9 tona po hektaru godišnje. Autohtone šume pokazale su minimalne stope erozije od 0,014 tona po hektaru godišnje, dok su zemljišta izložena procesima degradacije zabeležila najviše stope od oko 3,5 tone po hektaru godišnje. Ovi rezultati ističu hitnu potrebu za efikasnim strategijama kontrole erozije radi očuvanja prirodnih resursa i održavanja poljoprivredne produktivnosti. Istraživanje pruža važne uvide za donošenje odluka koji teže sprovođenju održivih praksi zaštite zemljišta i upravljanja zemljištem u tropskim regionima.

Educational, health and cultural aspects of
environmental protection

Obrazovni, zdravstveni i kulturni aspekti
zaštite životne sredine

STEM CELLS: TO TREAT AND UNDERSTAND DISEASES

Miodrag Stojković

MEEI, Harvard Medical, Boston, Massachusetts, USA

SPEBO Medical, Leskovac, Serbia

Stem cells (SC) are unique because they can potentially develop into many different types of cells in the human body. Their versatility and self-renewal capabilities make them a powerful tool in medicine and research. There are several types of SC, the most important are: 1) embryonic stem cells (ESC), derived from early-stage embryos (blastocysts). ESC are pluripotent, meaning they can differentiate into almost any cell type in the body. 2) Induced pluripotent SC (iPSC) are created by reprogramming adult cells (e.g., skin cells) to a pluripotent state, similar to ESC. 3) Mesenchymal SC (MSC) are found in the bone marrow, fat, and other tissues. MSC are multipotent, with the ability to differentiate into bone, cartilage, and fat cells. 4) Hematopoietic SC (HSC) are found in blood and they can differentiate into a limited range of cell types and can be used in treatments like bone marrow transplants for leukemia. The abilities to differentiate and stay in pluri-/multipotent status are regulated by molecular mechanisms including transcription factors (Oct4, Sox2, and Nanog); signaling pathways (Wnt, Notch, and Hedgehog); epigenetic modifications (chemical changes to DNA and histones that affect gene expression without altering the DNA sequence); micro-environment (niche - the cellular and molecular environment surrounding stem cells that influences their behavior including extracellular matrix components, adjacent cell types, and soluble factors). SC are used in regenerative medicine i.e., to repair or replace damaged tissues and organs; in cancer treatment, for instance, HSC transplants (bone marrow transplants) to treat lymphoma; drug testing and development, especially iPSC help to create disease models for testing new drugs, allowing researchers to study how drugs affect specific cell types; personalized medicine i.e., by creating patient-specific iPSC, researchers can develop customized treatments based on an individual's unique genetic makeup and to understand disease mechanisms. In summary, SC are a cornerstone of modern biomedical research and therapeutic innovation. Their ability to transform into various cell types and their potential to revolutionize medicine make them a focal point for ongoing scientific exploration and clinical applications.

MATIČNE ĆELIJE: ZA LEČENJE I RAZUMEVANJE BOLESTI

Miodrag Stojković

MEEI, Harvard Medical, Boston, Massachusetts, SAD

SPEBO Medical, Leskovac, Srbija

Matične ćelije (MC) su jedinstvene jer se potencijalno mogu razviti u različite tipove ćelija ljudskog tela. Njihova svestranost i sposobnosti samoobnavljanja čine ih moćnim oruđem u medicini i istraživanju. Postoji nekoliko tipova MC, najvažniji su:

1) embrionalne matične ćelije (EMĆ), izvedene iz embriona u ranoj fazi (blastociste). EMĆ su pluripotentne, što znači da se mogu diferencirati u skoro svaki tip ćelije u telu. 2) Indukovane pluripotentne MĆ (iPMĆ) se stvaraju reprogramiranjem odraslih ćelija (npr. ćelija kože) u pluripotentno stanje, slično EMĆ. 3) Mezenhimalne matične ćelije (MMĆ) nalaze se u koštanoj srži, masti i drugim tkivima. One su multipotentne, sa sposobnošću da se diferenciraju u kosti, hrskavicu i masne ćelije. 4) Hematopoetske MĆ (HMĆ) se nalaze u krvi i mogu se diferencirati u ograničen raspon tipova ćelija a koriste se u tretmanima kao što je transplantacija koštane srži za leukemiju. Sposobnosti diferencijacije i zadržavanja u pluri-/multipotentnom statusu su regulisane molekularnim mehanizmima uključujući transkripcione faktore (Oct4, Sox2 i Nanog); signalnim putevima (Wnt, Notch i Hedgehog); epigenetskim modifikacijama (hemijske promene DNK i histona koje utiču na ekspresiju gena bez promene sekvence DNK); mikrookruženjem (niša - ćelijsko i molekularno okruženje koje utiče na njihovo ponašanje a tu spadaju komponente ekstracelularnog matriksa, susedni tipovi ćelija i rastvorljivi faktori). MĆ se koriste u regenerativnoj medicini, odnosno za popravku ili zamenu oštećenih tkiva i organa; u lečenju raka, na primer, transplantacije HMĆ (transplantacije koštane srži) za lečenje limfoma; testiranje i razvoj lekova, posebno iPMĆ pomažu u stvaranju modela bolesti za testiranje novih lekova, omogućavajući istraživačima da proučavaju kako lekovi utiču na specifične tipove ćelija; personalizovanu medicinu, tj. kreiranjem iPMĆ specifičnog za pacijenta, istraživači mogu da razviju prilagođene tretmane zasnovane na jedinstvenom genetskom sastavu pojedinca i da razumeju mehanizme bolesti. Zato su MĆ kamen temeljac modernih biomedicinskih istraživanja i terapijskih inovacija. Njihova sposobnost da se transformišu u različite tipove ćelija i njihov potencijal da revolucionišu medicinu čine ih žarišnom tačkom za tekuća naučna istraživanja i kliničke primene.

TOXIC EFFECTS OF CHEMICAL SUBSTANCES - MECHANISMS AND CLINICAL MANIFESTATIONS

Vitomir Ćupić, Silva Dobrić, Mirjana Bartula, Svetozar Krstić, Saša Vasilev

Faculty of Applied Ecology Futura, Metropolitan University, Republic of Serbia
Faculty of Medicine, Military Medical Academy, University of Defense, Belgrade, Serbia

Faculty of Applied Ecology Futura, Metropolitan University, Republic of Serbia
Educons University, Academy of Hospitality, Tourism and Wellness; Belgrade, Serbia

Institute for the Application of Nuclear Energy, INEP, Zemun, Republic of Serbia

A large number of chemical compounds are used in the world today. A significant part of these means are pesticides, ie biocides. There is almost no branch of human activity where these means have not found their application, and agricultural production has become practically impossible without their application.

Unfortunately, in many cases, we are witnessing that these funds, especially in agriculture, are used rather irrationally. Therefore, poisonings in humans and domestic

animals are becoming more common. In addition to numerous chemical substances, such as various insecticides (ovicides, larvicides, adulticides, attractants and repellents), rodenticides (raticides and muricides), fungicides, limacides (molluscicides), herbicides (silvicides, desiccants and defoliant), poisoning in humans, especially animals can also cause some plants (namely alkaloids, glycosides and saponins - toxic substances contained in them), which animals can consume, especially when they are hungry.

The aim of this work is to show the most important mechanisms of the toxic action of chemical substances, and to indicate the possible consequences, i.e. to what clinical manifestations these interactions can lead to, depending on the mode of action, i.e. with which cell molecule a xenobiotic has interacted.

TOKSIČNO DELOVANJE HEMIJSKIH SUPSTANCIJA - MEHANIZMI I KLINIČKE MANIFESTACIJE

Vitomir Ćupić, Silva Dobrić, Mirjana Bartula, Svetozar Krstić, Saša Vasilev

Fakultet za primenjenu ekologiju Futura, Univerzitet Metropolitani, Republika Srbija
Medicinski fakultet Vojnomedicinske akademije, Univerzitet odbrane, Beograd, Srbija

Fakultet za primenjenu ekologiju Futura, Univerzitet Metropolitani, Republika Srbija
Univerzitet Educons, Akademija za hotelijerstvo, turizam i wellnes; Beograd, Srbija
Institut za primenu nuklearne energije, INEP, Zemun, Republika Srbija

Veliki broj hemijskih jedinjenja danas se svakodnevno koristi u svetu. Značajan deo ovih sredstava čine pesticidi, odnosno biocidi. Gotovo da nema grane ljudske delatnosti, gde ova sredstva nisu našla svoju primenu, a poljoprivredna proizvodnja postala je praktično nemoguća bez njihove primene.

Nažalost, u mnogim slučajevima, svedoci smo da se ova sredstva i to pre svega u poljoprivredi prilično neracionalne koriste. Stoga su trovanja kod ljudi i domaćih životinja sve češća. Pored mnogobrojnih hemijskih supstancija, kao što su razni insekticidi (ovicidi, larvicidi, adulticidi, atraktanti i repelenti), rodenticidi (raticidi i muricidi), fungicidi, limacidi (molluscicidi), herbicidi (silvicidi, desikanti i defolianti), trovanje kod ljudi, naročito životinja mogu uzrokovati i neke biljke (odnosno alkaloidi, glikozidi i saponini-toksične materije sadržane u njima), koje životinje mogu konzumirati, naročito kada su gladne.

Cilj ovog rada je da prikaže najvažnije mehanizme toksičnog delovanja hemijskih supstancija, te da u zavisnosti od načina delovanja, odnosno sa kojim je ćelijskim molekulom stupio neki ksenobiotik u interakciju, ukaže na moguće posledice, odnosno do kakvih kliničkih manifestacija mogu dovesti navedene interakcije.

PIG PRODUCTION AND *TRICHINELLA*, ENVIRONMENT AND SUSTAINABILITY

Saša Vasilev, Branko Suvajdžić, Ivana Mitić, Vitomir Ćupić, Dragan Vasilev

University of Belgrade, Institute for the Application of Nuclear Energy - INEP, Belgrade, Serbia

Agrobusiness has an important role in the Serbian economy and is responsible for the food supply and raw materials for industry. Among the activities of Serbian agriculture, we wish to highlight pig farming which is one of the most polluting agricultural activities, causing environmental degradation, due to the volume of waste produced and air degradation, impact on water resources and soil. Because of that sustainable development and implementation of sanitary measures are important. At the same time public health, consumer health and food safety are very important and are well regulated. Prevention of infection is dependent on minimizing exposure to potential sources of infection also to *Trichinella* spp. In Serbia we have two species of *Trichinella*: *T. spiralis* and *T. britovi*. Climate changes bring the possibility of new species of *Trichinella* reach Serbia and have impact on *Trichinella* ecology. Parasitic nematodes of the genus *Trichinella* cause trichinellosis, a serious zoonotic disease. People acquire trichinellosis by consuming raw or undercooked meat infected with the *Trichinella* larvae. Pig raised under non controlled housing condition is at higher risk. The gold standard in meat inspection for the presence of *Trichinella* larvae is the use of the artificial digestion method. For the prevention of human infection and for international trade purposes there are regulations for the inspection of meat as well as for quality control. With the help of this, we exclude the meat of infected animals from the food chain so it reduce the possibility of infecting new animals and transmission to humans.

UZGOJ SVINJA I UTICAJ TRIHINELA NA ŽIVOTNU SREDINU

Saša Vasilev, Branko Suvajdžić, Ivana Mitić, Vitomir Ćupić, Dragan Vasilev

Univerzitet u Beogradu, Institut za primenu nuklearne energije - INEP, Beograd, Srbija

Univerzitet u Beogradu, Fakultet veterinarske medicine, Srbija

Univerzitet Metropolitan Beograd, Fakultet za primenjenu ekologiju – Futura

Poljoprivreda ima važnu ulogu u privredi Srbije i odgovorna je za snabdevanje hranom i sirovinama. Jedna od važnih poljoprivrednih grana je uzgoj svinja koja istovremeno dovodi i do velikog zagađenja životne sredine, zbog obima proizvedenog otpada i degradacije vazduha, kao i uticaja na vodne resurse i zemljište. Zbog toga je važan održivi razvoj i sprovođenje sanitarnih mera. Istovremeno jako su važni javno zdravlje, zdravlje potrošača i bezbednost hrane, pa su te oblasti dobro regulisane. Prevencija infekcija zavisi od minimiziranja izloženosti potencijalnim izvorima infekcije pa tako i trihinelu. U Srbiji imamo dve vrste *Trichinella*: *T. spiralis* and *T. britovi*. Klimatske promene donose mogućnost da se nove vrste trihinele nadju u Srbiji i utiču na ekologiju trihinele. Parazitske nematode iz roda trihinelu izazivaju trihinelozu, ozbiljnu zoonotsku bolest. Ljudi se razbole posle konzumiranja sirovog ili nedovoljno termički obrađenog mesa zaraženog larvama trihinele. Svinje uzgajane u nekontrolisanim uslovima smeštaja su pod većim rizikom da budu inficirane trihine-

lom. Zlatni standard u kontroli mesa na prisustvo larvi trihinela je upotreba metode veštačke digestije. Za prevenciju infekcije ljudi i za potrebe međunarodne trgovine postoje propisi za pregled mesa, kao i za kontrolu kvaliteta tog pregleda. Na taj način isključujemo meso zaraženih životinja iz lanca ishrane, čime se smanjuje mogućnost zaraze novih životinja i prenošenja na ljude.

„GREEN RECOVERY” FROM COVID-19“ - A NEW VISION OF THE IMPACT OF CLIMATE CHANGE ON THE EMERGENCE OF PANDEMICS

Biljana Prodović Milojković, Tanja Prodović, Šćepan Sinanović

Metropolitan University Faculty of Applied Ecology - Futura, Belgrade, Serbia
High Medical College of Professional Studies „Milutin Milanković“, Belgrade, Serbia

In order to better understand pandemics, which are increasingly difficult to analyze due to significant multidimensional effects and irregular cycles, special attention is paid to the relationship between pandemics and the environment. The outbreak of COVID-19 has also brought with it unstable, already largely forgotten, values (like the reduction of CO₂ emissions in the case of China or crystal clear water in the canals of Venice). In order to understand the impact of the COVID-19 pandemic on the environment, the authors point out that it is necessary to analyze and supplement this relationship in the context of certain scientific research that has dealt with this topic. In this regard, they emphasize the increasing dominance of man over the environment in a negative context, which results in, among other things, the increasingly frequent occurrence of pandemics. The author's intention in the paper is to analyze the insufficiently researched cause-and-effect relationship between the environment and the health crisis based on existing insights, based on which action steps would be taken that would go in the direction of “green recovery” from COVID-19; and all in order to improving public health, sustainable economy and environmental protection.

“ZELENI OPORAVAK” OD COVID-19 - NOVA VIZIJA UTICAJA KLIMATSKIH PROMENA NA POJAVU PANDEMIJA

Biljana Prodović Milojković, Tanja Prodović, Šćepan Sinanović

Fakultet za primenjenu ekologiju – Futura, Beograd, Srbija
Visoka medicinska škola strukovnih studija „Milutin Milanković“, Beograd, Srbija

Kako bi na što bolji način pokušali da razumemo pandemije, koje je usled značajnih višedimenzionalnih efekata i neregularne cikličnosti, sve teže analizirati, posebnu pažnju zauzima relacija između pandemije i životne sredine. Izbijanje COVID-19 sa sobom je donelo i neustaljene, već uveliko zaboravljene, vrednosti (poput smanjenja emisije CO₂ u slučaju Kine ili kristalno čiste vode u kanalima Venecije). Radi razumevanja uticaja pandemije COVID-19 na životnu sredinu, autori poentiraju da je

potrebno ovu vezu analizirati i dopuniti u kontekstu određenih naučnih istraživanja koja su se bavila ovom temom.

U tom pogledu naglašavaju sve veću dominaciju čoveka nad životnom sredinom u negativnom kontekstu, što za rezultat ima, između ostalog, i sve učestaliju pojavu pandemija. Namera autora u radu je da na osnovu postojećih uvida analiziraju nedovoljno istraženu uzročno posledičnu vezu između životne sredine i zdravstvene krize, na osnovu kojih bi se izveli i akcioni koraci koji bi išli u pravcu “zelenog oporavka” od COVID-19; a sve u cilju poboljšanja javnog zdravlja, održive ekonomije i zaštite životne sredine.

RURAL TOURISM AS A FACTOR OF THE COMPETITIVENESS OF THE SREM DISTRICT

Nada Kosanović, Goran Knežević

Metropolitan University Faculty of Applied Ecology - Futura, Belgrade, Serbia

The creators and actors of the tourist offer of Srem should operate according to the rules imposed by the current situation on the market, and to the greatest extent possible have to apply the competitive advantage that ensures the rich cultural, historical, folklore and rural treasures of the Srem district.

The title of the paper points to the necessity of creating a competitive advantage of the Srem rural area, where, through a combination of different aspects and value perceptions, family farms are differentiated by the success of branding products and areas, and intangible marketing assets: brands, market knowledge, relationship with customers, service and product quality, coverage distribution, become significant value components of the region.

In the paper, an overview of the internal and external factors of the development of sustainable rural tourism in the Srem district was shown by a SWOT analysis, performed and tested through the TOWS matrix of sustainable use of natural resources in the rural areas of the Srem district. The results of the TOWS matrix point to the necessity of diversifying the Srem rural area in order to increase the relative tourist market share and growth rate of the tourist market and create the perception of the Srem rural area as a significant economic potential.

RURALNI TURIZAM KAO FAKTOR KONKURENTNOSTI SREMSKOG OKRUGA

Nada Kosanović, Goran Knežević

Fakultet za primenjenu ekologiju Futura, Univerzitet Metropolitan, Beograd, Srbija

Kreatori i akteri turističke ponude Srema, treba da posluju po pravilima koju nameće trenutna situacija na tržištu i da, u što je moguće većoj meri, primenjuju konkurentsku prednost koja obezbeđuje bogato kulturno, istorijsko, folklorno i ruralno blago Srema.

Naslov rada ukazuje na nužnost kreiranja konkurentske prednosti Sremskog ruralnog prostora, gde se kombinacijom različitih aspekata i vrednosnih percepcija, porodična gazdinstva diferenciraju po uspešnosti brendiranja proizvoda i područja a nematerijalna marketinška imovina: brendovi, poznavanje tržišta, odnos sa kupcima, kvalitet usluge i proizvoda, pokrivenost distribucije, postatju značajne vrednosne komponente regije.

U radu je izvršen pregled internih i eksternih faktora razvoja održivog ruralnog turizma Sremskog okruga, prikazanih SWOT analizom koji se testiraju kroz TOWS matricu održivog korišćenja prirodnih resursa ruralnih područja Srema. Rezultati TOWS matrice ukazuju na nužnost diversifikacije Sremskog ruralnog područja radi povećanja relativnog tržišnog turističkog učešća i stope rasta turističkog tržišta i kreiranja percepcije sremskog ruralnog prostora kao značajnog privrednog potencijala.

THE INDEX OF BONINESS IN DIFFERENT TYPES OF DONKEYS

Milivoje Urošević, Milena Đorđević, Dejana Čupić Miladinović, Yusuf Ograk, Nikola Cukić

Center for Preservation of Indigenous Breeds, Belgrade-Zemun, Serbia,
University of Belgrade, Faculty of Veterinary Medicine, Department of Anatomy, Serbia

Cumhuriyet University, Veterinary Faculty, Department of Animal Breeding and Husbandry, Sivas, Turkey

The domestic donkey (*Equus asinus*) originates from Africa. When looking at the globe, there are practically no regions where donkeys do not perform some of the most diverse forms of work. Their ability to perform hard work and great endurance are based on a specific biostatic body model. The basic parameter for assessing body conformation is the index of boniness. This is the ratio of the circumference of the tibia to the height at the withers. It is known that donkeys, as a species, are quite phenotypically heterogeneous. This primarily refers to the height at the withers. There are donkeys with a height at the withers of 90 cm, and even lower, and others whose height at the withers reaches up to 150 cm.

Studying donkeys in eastern Algeria, Hannani et al. (2020) found a height at the withers ranging from 101 to 131 cm and a tibia circumference from 11 to 17 cm. The index of boniness ranged from 10.89 to 12.98. Urošević et al. (2019) determined that the population of white baroque donkeys in Austria had an average tibia circumference of 14.0 cm and an average height at the withers of 115.5 cm. Their index of boniness was 12.12. Regarding the tibia circumference of donkeys on the island of Rab (Croatia), Urošević et al. (2019) found an average value of 13.3 cm for males and 13.2 cm for females. The average height at the withers for males was 100.8 cm and for females 95.4 cm. The index of boniness for males was 13.19 and for females 13.83. Studying domestic donkey breeding in Austria, Urošević et al. (2022) found a tibia circumference ranging from 12 to 16 cm and a height at the withers from 99.6 to 140.6 cm. In this population, the index of boniness ranged from 11.38 to 12.05.

In the observed donkey populations, the differences in the value of the index of boniness between male and female animals are minimal. Overall, the differences in height

at the withers were 37.3%, and in the index of boniness 26.99%.

Regardless of the height of the withers, that is, the size of the body, if they work in the same and similar ecological niche with a similar or the same biocenosis, donkeys must have and have a very similar biostatic model

INDEKS KOŠČATOSTI KOD RAZLIČITIH TIPOVA MAGARACA

Milivoje Urošević, Milena Đorđević, Dejana Čupić Miladinović, Yusuf Ograk, Nikola Cukić

COAR-Centar za očuvanje autohtonih rasa, Beograd-Zemun
Univerzitet u Beogradu, Fakultet veterinarske medicine, Katedra za anatomiju
Univerzitet u Sivasu (TR), Veterinarski fakultet, Katedra za stočarstvo

Domaći magarac (*Equus asinus*) potiče iz Afrike. Kada se pogleda zemljina kugla praktično ne postoje regioni gde magarci ne obavljaju neki od, najrazličitijih oblika rada. Mogućnost obavljanja teškog rada i velika izdržljivost bazirani su na specifičnom biostatičkom modelu tela. Osnovni parametar za procenu građe tela je indeks koščatosti. To je odnos obima cevanice sa visinom grebena. Poznato je da su magarci, kao vrsta, prilično, fenotipski heterogeni. Reč je, pre svega o visini grebena. Postoje magarci sa visinom grebena od 90 cm, a i niže i drugi čija visina greban doseže do 150 cm.

Proučavajući magarce u istočnom Alžiru Hannani i sar. (2020) utvrdili su visinu grebena od 101-131 cm, a obim cevanice od 11-17 cm. Indeks koščatosti bio je 10,89-12,98. Urošević i sar. (2019) u populaciji belog baroknog magarca u Austriji utvrdili su prosečni obim cevanice od 14,0 cm i prosečnu visinu grebena od 115,5 cm. Njihov indeks koščatosti bio je 12,12. Kada je reč o obimu cevanice magaraca na otoku Rabu (HR) Urošević i sar.(2019) utvrdili su prosečnu vrednost kod mužjaka od 13,3 cm i ženki 13,2 cm. Prosečna visina grebena mužjaka bila je 100,8 cm i ženki 95,4 cm. Indeks koščatosti mužjaka bio je 13,19 i ženki 13,83. Proučavajući zemaljski uzgoj magaraca u Austriji Urošević i sar. (2022) utvrdili su obim cevanice od 12-16 cm uz visinu grebena od 99,6-140,60. U ovoj populaciji indeks koščatosti bio je 11,38-12,05. U posmatrasnim populacijama magaraca razlike u vrednosti indeksa koščatosti muških i ženskih grla su minimalne. Ukupno posmatrano razlike u visini grebena bile su 37,3%, a u indeksu koščatosti 26,99%.

Bez obzira na visinu grebena, odnosno veličinu tela, ako obavljaju posao u istoj i sličnoj ekološkoj niši sa sličnom ili istom biocenozom, magarci moraju imati i imaju veoma sličan biostatički model.

NECESSARY AMOUNTS OF WATER FOR SUCCESSFUL FREE-RANGING DONKEY FARMING

Milivoje Urošević, Danka Štastna, Pavel Štastny, Tsegmid Namsraijav

CEPIB – Center for Preservation of Indigenous Breeds, Belgrade-Zemun, Serbia
Faculty of Agrobiological and Food Resources, Institute of Animal Science, Slovak University of Agriculture in Nitra, Slovakia
Agroecological Faculty, Department of Ecology, Mongolian University, Ulaanbaatar, Mongolia

In the last decade, livestock farming in many European countries has been characterized by a sudden increase in interest in donkey breeding (*Equus asinus*). The former primary role of the donkey as a working animal in Europe has almost completely disappeared.

The costs of livestock production decrease if the livestock spends most of the year outside the barn. Free-ranging livestock farming is the most cost-effective. The more days livestock spend in free grazing and the fewer days in the barn, the higher the profitability.

When it comes to domestic donkeys, they drink 5-10 liters of water per 100 kg of body weight per day. The amount of water needed depends on the succulence of the grass available to them. In climatic areas without scorching summers, the grass is juicier and contains more water, allowing donkeys to partially meet their water needs through food intake. In regions with a typical continental climate and scorching summers, the grass is much drier, and it is necessary to provide donkeys with enough water. The water must be organoleptically safe. The donkey is a very reliable indicator of the pollution of the ecological system that causes water pollution. He will remain thirsty but will not drink water that is not clean or has an unpleasant odor. Additionally, the water must be fresh.

Donkeys can meet their water needs in several ways. If there is a natural watercourse, donkeys will readily come to the shore and drink water. In case the shore is high, it is necessary to create ramps for access to water. If there is no natural water source, it is necessary to create a trough into which artesian water is piped. Where there is no artesian water, it is necessary to dig a well and manually or with a pump fill the troughs with water. If there is no well, then water must be brought in and fixed tanks filled from which the troughs are filled.

POTREBNE KOLIČINE VODE ZA USPEŠAN SLOBODAN UZGOJ MAGARACA

Milivoje Urošević, Danka Štastna, Pavel Štastny, Tsegmid Namsraijav

COAR – Centar za očuvanje autohtonih rasa, Beograd-Zemun, Srbija
Fakultet za agrobiologiju i prehrambene resurse, Institut za stočarstvo. Univerzitet u Njitra, Slovačka
Agroekološki fakultet, Departman za ekologiju, Mongolski univerzitet, Ulan Bator, Mongolija

Poslednju deceniju, kada je reč o stočarstvu, u mnogim evropskim državama karakteriše naglo povećanje interesovanja za uzgoj magaraca (*Equus asinus*). Nekadašnju, osnovnu, ulogu kao radna životinja, u Evropi, magarac je gotovo potpuno izgubio.

Troškovi stočarske proizvodnje padaju ukoliko je stoka veći deo godine van štale.. Slobodan uzgoj stoke je najrentabilniji. Što je više dana u slobodnoj ispaši, a manje u štali rentabilnost je veća.

Kada je reč o domaćem magarcu od dnevno pije 5-10 lit. vode na 100 kg telesne mase. Količina potrebne vode zavisi od sočnosti trave koja im je na raspolaganju. U klimatskim područjima gde nema žarkih leta trava je sočnija, punija vodom, i magarci deo potreba u vodi zadovoljavaju unošenjem hrane. Tamo gde je tipična kontinentalna

klima, sa žarkim letima, trava je znatno suvlja i magarcima je neophodno obezbediti dovoljno vode. Obavezno je da voda bude organoleptički ispravna. Magarac je veoma pouzdan indikator zagađenja ekološkog sistema koje uslovljava zagađenje vode. On ostaje žedan, ali ne pije vodu koja nije čista i koja, eventualno ima neprijatan miris. Osim toga voda mora biti sveža.

Zadovoljenje potrebe za vodom magarci mogu ostvariti na nekoliko načina. Ako postoji prirodan vodotok magarci rado dolaze do obale i piju vodu. U slučaju da je obala visoka neophodno je napraviti useke za prilaz do vode. U slučaju da nema prirodne vode neophodne je napraviti pojilo u koje se cevima sprovodi arteska voda. Gde nema arteske vode neophodno je iskopati bunar i manuelno ili pumpom nalevati vodu u pojila. Ako nema ni bunara onda se voda mora donositi i puniti fiksirane cisterne iz kojih se puni pojilo.

TOUCH WITH NATURE'S INTELLIGENCE

Ivan Jušković

Electrical engineer, holistic massage therapist, environmental activist.
Founder of the environmental initiative "Družina Hrasta" about personal creative work to preserve the original nature of planet Earth.

The current mainstream of our civilization does not consider the original world of nature to be reasonable, that it does not possess the power to understand reality, intelligence. Research experience confirms the opposite.

The goal of this investigate is to help preserve the natural world through conscious, compassionate human action. So save us from self-destruction. Scientifically and technologically, we are mature enough to be able to "hear" and understand the great being of nature.

Measuring instruments for measuring the strength of the electric field were used to measure the radiation of areas with and without wild vegetation. And with a device for listening to the "music" of plants, the changes in the melody of the melodic sounds created at the moment were observed when the plant was creating alone or in cooperation with man. The method is based on modulating with an appropriate sound, audible to us, the change in the vibration of electrical resistance between the leaves and the roots of the plant.

By measuring the electromagnetic potential site, it was observed that plants receive energy from the ground and amplify it in accordance with the personal characteristics of the species and plant communities of wild plants. Nature as a resonator. And listening to the "music" of plants, it was noticed that plants react to our thoughts, words and actions. The answer comes in a moment, a few seconds, when the melody of the "music" changes, or the plant becomes silent if it is unfavorable for it.

The conclusion is that people have the power to multiply the life-giving force of every living being out of love and kindness and in harmony with nature, but to destroy everything out of unconsciousness and split from nature.

DODIR SA "INTELIGENCIJOM" PRIRODE

Ivan Jušković

Elektro inženjer, holistički terapeut u masaži, ekološki aktivista.

Osnivač ekološke inicijative o ličnom stvaralačkom radu na očuvanju izvorne prirode planete Zemlje „Družina Hrasta“.

Trenutni glavni tok naše civilizacije ne posmatra izvorni svet prirode razumnim, da ne poseduje moć poimanja stvarnosti, inteligenciju. Iskustvo istraživanja potvrđuje suprotno.

Cilj istraživanja je da se pomogne očuvanje prirodnog sveta kroz svesno, samilosno delovanje čoveka. Tako sačuvati od samouništenja nas same. Naučno i tehnološki smo dorasli da možemo da „čujemo“ i poimamo veliko biće prirode.

Mernim instrumentima za merenje jačine električnog polja merena su zračenja prede-la sa i bez samoniklog biljnog rastinja. A aparatom za slušanje „muzike“ biljaka promatrane su promene u melodiji trenutno nastalih melodičnih zvukova kada je biljka sama ili u sadejstvu sa čovekom stvarala. Metod se zasniva na modulisanju prigodnim zvukom, čujnim za nas, promene titraja električne otpornosti između lišća i korena biljke.

Mereći elektromagnetno potentno mesto zapaženo je da biljke primaju energiju iz zemlje i pojačavaju je u saglasju sa ličnim osobenostima vrste i biljnim zajednicama samoniklog bilja. Priroda kao rezonator. A slušajući „muziku“ biljaka zapaženo je da biljke reaguju na naše pomisli, reči i dela. Odgovor nastaje za koji trenutak, par sekundi, izmeni se melodija „muzike“, ili biljka začuti ukoliko je nepovoljno po nju. Zaključak je da čovek ima moć da iz ljubavi i dobrote i u saglasju sa prirodom umnogostručni životvornu snagu svakog živog bića, ali iz nesvesti i podvojen od prirode sve da uništi. Ključne reči: priroda, rezonator, „muzika“ biljaka.

Indeks

A

Aleksić Uroš 7, 13, 29

Andrejić Gordana 3, 7, 13, 29

B

Babić Anja 3, 6, 12, 25, 26

Bartula Mirjana 3, 6, 7, 9, 12, 13, 15, 28, 36, 37, 53, 54

Bernardes Joaquim Ernesto Ayer 14, 48, 49

Brajević Snežana 7, 13, 29

C

Cukić Nikola 10, 15, 58, 59

Cupać Tanja 6, 12, 28

Cvetković Anka 3, 6, 12, 21, 22, 23

Ć

Ćupić Miladinović Dejana 7, 10, 13, 15, 35, 58, 59

Ćupić Vitomir 3, 7, 8, 9, 13, 14, 15, 36, 37, 38, 47, 53, 54, 55

Č

Činčurak Erceg Biljana 3, 8, 9, 14, 41, 42

Čučulović Ana A. 3, 6, 12, 20

Čučulović Rodoljub D. 6, 12, 20

Čosevski Miroslav 3, 6, 7, 12, 13, 26, 27, 35

D

Dobeić Martin 7, 13, 34

Dobrić Ena 6, 7, 12, 13, 26, 27, 35

Dobrić Silva 7, 8, 9, 13, 15, 36, 37, 38, 53, 54

Duić Dunja 3, 8, 24, 46

Dž

Dželetović Željko 7, 13, 29

Đ

Đorđević Dragana 6, 12, 24

Đorđević Milena 10, 15, 58, 59

E

Erceg Aleksandar 9, 14, 48

I

Ignjatović Ljubiša 6, 12, 24

J

Janković Vladimir 6, 12, 28
Jerković Emina 8, 14, 42, 43
Jušković Ivan 10, 15, 61, 62

K

Kastratović Vlatko 7, 13, 30, 31
Kataranovski M 7, 13, 33
Kataranovski D 7, 13, 33
Knežević Bojana 3, 6, 7, 12, 13, 25, 26, 30, 31
Knežević Goran 3, 10, 15, 57
Kobal Silvestra 3, 7, 13, 34
Kodranov Igor 6, 12, 24
Kosanović Nada 9, 10, 15, 57
Krin Boduljak Rita 9, 14, 48, 49
Krstić Svetozar 3, 7, 8, 9, 13, 14, 15, 36, 37, 47, 53, 54
Krstić Vladimir 14, 47
Kukec Ljiljana 9, 14, 48, 49

M

Mihajlidi-Zelić Aleksandra 6, 12, 24
Milanović Nikola 7, 13, 29
Mincato Ronaldo Luiz 3, 9, 14, 49, 50
Mirkov I 7, 13, 33
Mitić Ivana 3, 9, 15, 54, 55

N

Namsraijav Tsegmid 10, 15, 59, 60

O

Ograk Yusuf 10, 15, 58, 59

P

Perić Renata 8, 14, 42, 43
Popov Aleksandrov A 7, 13, 33
Prodović Milojković Biljana 9, 15, 56
Prodović Tanja 9, 15, 56

R

Radusin K 7, 13, 33
Rakić Tamara 6, 12, 21, 22, 23

S

Sakan Sanja 6, 12, 24
Santana Derielsen Brandão 3, 9, 14, 49, 50
Silva Bruno Aurélio 3, 9, 14, 49, 50
Silva Rios Guilherme 3, 9, 14, 49, 50
Simić Aleksandar 7, 13, 29
Sinanović Šćepan 9, 15, 56
Spalevic Velibor 3, 8, 9, 14, 43, 44, 49, 50
Stanojković Jelena N. 3, 6, 12, 20
Stojković Miodrag 5, 9, 12, 14, 17, 52
Suvajdzić Branko 9, 15, 54, 55

Š

Šekler Ivana 3, 6, 12, 28
Šoštarić Andrej 3, 6, 12, 21, 22, 23
Štastny Pavel 10, 15, 59, 60
Štastna Danka 10, 15, 59, 60

U

Urošević Milivoje 10, 15, 58, 59, 60

V

Vasilev Dragan 9, 15, 54, 55
Vasilev Saša 3, 7, 9, 13, 15, 36, 37, 53, 54
Vasilj Aleksandra 8, 14, 44, 45
Velev Romel 3, 6, 7, 12, 13, 26, 27, 35

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