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International Scientific Conference
SUSTAINABLE DEVELOPMENT AND
GREEN ECONOMY
BOOK OF ABSTRACT

Međunarodna naučna konferencija
ODRŽIVI RAZVOJ I
ZELENA EKONOMIJA
KNJIGA APSTRAKATA

Belgrade / Beograd, 19-21 April 2022

ECOLOGICA

Izdavač:

Naučno-stručno društvo za zaštitu životne sredine Srbije ECOLOGICA
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INTERNATIONAL SCIENTIFIC CONFERENCE

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FOREWORD

This year, as in the previous 29, we are celebrating World Earth Day by organizing an international scientific conference dedicated to the current topic: *Sustainable Development and the Green Economy*. Due to the limitations caused by the COVID-19 pandemic, the conference is planned in a hybrid (face to face and online) mode using the Google meet platform.

In 2022, the International Scientific Conference was prepared in cooperation with the Scientific and Professional Society "ECOLOGICA" with ALFA BK University from Belgrade, Union of Engineers and Technicians of Serbia, Serbian Academy of Engineering, Institute for Multidisciplinary Research, Belgrade Chamber of Commerce, City Secretariat for Environmental Protection and under the auspices Ministry of Education, Science and Technological Development of the Republic of Serbia in Belgrade, in the premises of UETS with the cooperation of management, professors and administrators.

This year's scientific conference *Sustainable Development and Green Economy* focuses on many topics related to economic sustainability and environmental protection, which are divided into 5 scientific sections:

- New aspects in the development of the green economy,
- Environmental monitoring,
- Sustainable agriculture and forestry,
- Legal and financial aspects of the green economy,
- Ecotourism and sports.

The Conference was attended by about 180 participants from the country and abroad from various scientific fields: environmental monitoring and protection, economics, ecology, chemistry, biogeochemistry, physical chemistry, biotechnology, agronomy, environmental management, information technology, financial management, sociology, law and political science.

Scientific announcements were prepared by teachers and doctoral students of ALFA BK University, as well as the Institute of Economic Sciences, Belgrade Banking Academy, and other educational and research institutions (Institute for Multidisciplinary Research, Institute of Criminological and Sociological Research, Vinca Institute, NIVS, IHTM, Faculties of Geography, Forestry and Economics from Belgrade and Pristina, as well as the Faculty of Occupational Safety, University of Nis and many other faculties from state and private universities).

The best works of our and foreign scientists will be included in the International thematic monograph *Green economy and environmental sustainability*.

Quality analysis of the impact of technogenesis on the state of the environment and the sustainability of various spheres of industry, transport, ecotourism based on valid data and information, as well as the application of systems thinking and innovative technologies are of great High level to decision makers in the field of environmental protection. Special attention should be paid to the planning of future joint scientific research and the exchange of information in the field of environmental protection in order to develop scientific research. About 40 foreign scientists from 10 countries submitted scientific papers. Participation of foreign scientists in the International Scientific Conference serves the exchange of information and development of important directions in the field of environmental protection, and thus can accelerate the improvement of successful cooperation between Russian, Belarusian, Moldovan, Chinese, Macedonian, Slovak, Slovenian, Turkish, Armenian, Libyan and Serbian scientists in new international projects.

PREDGOVOR

Ove godine, kao i prethodnih 29, slavimo Svetski Dan Planete Zemlje organizovanjem međunarodnog naučnog skupa posvećenog aktuелnoj temi: *Održivi razvoj i zelena ekonomija*. Zbog ograničenja uslovljenih pandemijom COVID-19 konferencija planirana je u hibridnom (face to face i on-line) režimu uz korišćenje platforme Google meet.

Godine 2022 Međunarodna naučna Konferencija pripremljena je u saradnji Naučno stručnog društva „ECOLOGICA“ sa ALFA BK Univerzitetom, Beograd, Savezom inženjera i tehničara Srbije, Inženjerskom Akademijom Srbije, Institutom za multidisciplinarna istraživanja, Privrednom komorom Beograda, Gradskim Sekretarijatom za zaštitu životne sredine i pod pokroviteljstvom Ministarstva prosvete, nauke i tehnološkog razvoja Republike Srbije u Beogradu, u prostorijama SITS uz saradnju rukovodstva, nastavnika i administratora.

Ovogodišnja naučna konferencija *Održivi razvoj i zelena ekonomija* usredsređena je na mnoge teme povezane s održivošću ekonomije i zaštitom životne sredine, koje su raspoređene u 5 naučnih sekcija:

- Novi aspekti u razvoju zelene ekonomije,
- Monitoring životne sredine,
- Održiva poljoprivreda i šumarstvo,
- Pravno-finansijski aspekti zelene ekonomije,
- Ekoturizam i sport.

U radu Konferencije učestvovalo je oko 180 učesnika iz zemlje i inostranstva iz različitih naučnih oblasti: monitoringa i zaštite životne sredine, ekonomije, ekologije, hemije, biogeohemije, fizičke hemije, biotehnologije, agronomije, ekološkog menadžmenta, primene informacionih tehnologija, finansijskog menadžmenta, sociologije, prava i političkih nauka. Naučna saopštenja pripremili su nastavnici i doktorandi ALFA BK Univerziteta, a takođe Instituta ekonomskih nauka, Beogradske bankarske akademije, i drugih obrazovnih i istraživačkih institucija (Instituta za multidisciplinarna istraživanja, Instituta kriminoloških i socioloških istraživanja, Instituta Vinča, NIVS, IHTM, Geografskog, Šumarskog i Ekonomskog fakulteta iz Beograda i Prištine, a takođe Fakulteta zaštite na radu Univerziteta u Nišu i mnogih drugih fakulteta sa državnih i privatnih Univerziteta).

Najbolji radovi naših i stranih naučnika biće uključeni u Međunarodnu tematsku monografiju *Green economy and environment sustainability*.

Donosiocima odluka u oblasti zaštite životne sredine od velikog značaja su kvalitetne analize uticaja tehnogeneza na stanje životne sredine i na održivost različitih sfera industrije, transporta, ekoturizma koje se zasnivaju na validnim podacima i informacijama, a takođe primeni sistemskog mišljenja i inovativnih tehnologija. Posebnu pažnju treba posvetiti planiranju budućih zajedničkih naučnih istraživanja i razmeni informacija iz oblasti zaštite životne sredine u cilju razvoja naučno-istraživačkog rada.

Oko 40 stranih naučnika iz 10 zemalja, poslali su naučne radove. Učešće inostranih naučnika u Međunarodnoj naučnoj Konferenciji služi razmeni informacija i razvoju bitnih pravaca u oblasti zaštite životne sredine, i na taj način može pospešiti unapređenje uspešne saradnje ruskih, beloruskih, moldavskih, kineskih, makedonskih, slovačkih, slovenačkih, turskih, jermenskih, libijskih i srpskih naučnika u novim međunarodnim projektima.

STABLE LEAD ISOTOPE COMPOSITIONS IN COAL, COAL ASH AND COAL FLY ASH FROM SERBIA

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The Republic of Serbia predominantly produces electricity in thermal power plants (TPP) Nikola Tesla (A i B), Kolubara and Kostolac. They are supplied from Kolubara basin mines (Nikola Tesla (A i B), Kolubara) which produces three quarters of Serbian lignite (about 70%), with the mean annual production about 30 million tons of coal and from Kostolac basin (TE Kostolac) which produces 30% of lignite in Serbia. Coal combustion residuals include bottom ash, fly ash and slag. Environmental pollution by coal ash and fly ash has been intensively studied taking into account high content of potentially hazardous elements such as As, Pb, Cd and Cr. Tracking lead sources in environmental studies has usually been performed by stable lead isotopes. The presence, pathways and environmental impact of coal ash and fly ash can be identified using Pb isotopic compositions. In this study, isotopic compositions for 12 coal samples from Kolubara and Kostolac major coal mines and 12 fly ash samples from thermal power plants Kolubara (A and B), Kostolac (A and B), Nikola Tesla TENT (A3, A2, and B1) were determined. Samples were digested in mineral acids mixture. Lead concentration and stable Pb isotopes were measured by inductively coupled plasma mass spectrometry (ICP-MS). The results obtained might be useful in monitoring of Pb pollution from the examined sources, as well as in emission control.

Keywords: Pb isotopic fingerprint, combustion, emission, pollution.

IZOTOPSKI SASTAV OLOVA U UGLJU, UGLJENOM I LETEĆEM PEPELU U REPUBLICI SRBJI

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Republika Srbija pretežno proizvodi električnu energiju u termoelektranama (TE) Nikola Tesla (A i B), Kolubara i Kostolac. Ugalj za TE Nikola Tesla (A i B) i Kolubara se eksploatiše iz Kolubarskog basena, gde se proizvodi tri četvrtine srpskog lignita (oko 70%), a za TE Kostolac iz Kostolačkog basena, koji proizvodi 30% lignita u Srbiji. Ostaci sagorevanja uglja obuhvataju pepeo, leteći pepeo, i šljaku. Zagađenje životne sredine pepelom i letećim pepelom intenzivno se proučava usled visokog sadržaja potencijalno opasnih elemenata kao što su: As, Pb, Cd i Cr. Praćenje izvora olova u istraživanjima vezanim za kvalitet životne sredine može da se vrši na osnovu izotopskog sastava ovog elementa. U ovom radu određivane su koncentracije olova i izotopski sastav analizom 12 uzoraka uglja iz rudnika Kolubara i Kostolac i 12 uzoraka letećeg pepela iz TE Kolubara (A i B), Kostolac (A i B) i Nikola Tesla (TENT A3, A2 i B2). Uzorci su digestirani u mešavini mineralnih kiselina, a merenja su vršena metodom masene spektrometrije sa indukovano spregnutom plazmom (ICP-MS). Dobijeni rezultati mogu se koristiti u praćenju zagađenja olovom iz ispitivanih izvora, kao i u kontroli emisije.

Ključne reči: izotopi Pb, sagorevanje, emisija, zagađenje.