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MEĐUNARODNA NAUČNA KONFERENCIJA

ČETVRTA INDUSTRIJSKA REVOLUCIJA - ZNAČAJ ZA RAZVOJ ZELENE EKONOMIJE I ZAŠTITU ŽIVOTNE SREDINE

KNJIGA APSTRAKATA

INTERNATIONAL SCIENTIFIC CONFERENCE
ON

THE FOURTH INDUSTRIAL REVOLUTION - THE IMPORTANCE FOR GREEN ECONOMY PROGRESS AND ENVIRONMENTAL PROTECTION

BOOK OF ABSTRACTS

Beograd – Belgrade, 16 - 18. September 2020.

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FOREWORD

This year, as in the previous 27, we celebrated World Earth Day by organizing an international scientific conference dedicated to the current topic: ***The Fourth Industrial Revolution - importance for the development of the green economy and environmental protection***. Due to the constraints caused by the COVID-19 pandemic, the conference was held 16-18.09.2020 on-line using the Google meet platform.

The fourth industrial revolution marked the beginning of the 21st century with global diversification in the application of technologies originally developed in the 20th century. Advances in IT and ICT technologies are accelerating the application of all 20th century technologies. The explosive expansion of the scope of application of numerous technologies in all sectors of industry, as well as in the sphere of services, marked the progress and spiral development of new scientific fields.

Despite the severance of many global traffic, trade, business and cultural ties between countries, and sometimes within countries, during the COVID-19 pandemic, scientists, physicians, chemists and pharmacists worked together to find vaccines and drugs against the disease caused by the spread of the potent and unknown SARS-CoV-2 virus. COVID-19 treatment protocols changed every month of the pandemic. Favipiravir, avifavir, avigan, areplivir, coronavir and other new and generic experimental drugs are now being used instead of the old quinine-based antiviral drugs. Vaccines, which were synthesized for use against the Ebola virus in a modified form, became the basis for the Russian Sputnik-V vaccine.

Technologies from the 20th century have also found numerous applications in other sectors of the industry, for example in the sports industry (robotics, mechatronics, nanotechnology). Discoveries in the field of biogeochemistry enable the creation of new biotechnologies.

During the twenty-seven years of the existence of the journal ECOLOGICA, a large number of scientific papers have been published in it, dedicated to the most current problems of environmental protection:

- Green economy and environmental protection,
- Development goals in the 3rd millennium,
- Environment and adaptation of the economy to climate change,
- Impact of climate change on the environment and economy,
- Innovative strategies and technologies in environmental protection,
- Environment and human health.

This year's scientific conference Fourth Industrial Revolution - importance for the development of green economy and environmental protection is focused on many topics related to green economy and environmental protection, which are included in 6 scientific sections:

- Significance of the 4th Industrial Revolution for the development of green economy and circular economy,
- Development of smart cities and application of new technologies,
- Organic agriculture and ecotourism,
- The role of biogeochemistry in the development of biotechnology,
- Financing of environmental protection,
- Social dimensions and legal aspects of the fourth industrial revolution.

PREDGOVOR

Ove godine, kao i prethodnih 27, proslavili smo Svetski Dan Planete Zemlje organizovanjem međunarodnog naučnog skupa posvećenog aktuelnoj temi: ***Četvrta industrijska revolucija – značaj za razvoj zelene ekonomije i zaštitu životne sredine*.** Zbog ograničenja uslovljenih pandemijom COVID-19 konferencija je održana 16-18. 09.2020. u on-line režimu uz korišćenje platforme Google meet.

Četvrta industrijska revolucija obeležila je početak 21. veka globalnom diverzifikacijom u primeni tehnologija prvobitno razrađenih u 20. veku. Napredovanje IT i IKT tehnologija ubrzava primenu svih tehnologija iz 20. veka. Eksplozivno širenje opsega primene mnogobrojnih tehnologija u svim sektorima industrije,a takođe u sfere usluga obeležilo je progres i spiralni razvoj novih naučnih oblasti.

Uprkos prekidu mnogih globalnih saobraćajnih, trgovinskih, poslovnih i kulturnih veza između država, a ponekad i unutar država, za vreme pandemije COVID-19, naučnici, medicinari, hemičari i farmaceuti, su se trudili da zajedničkim naporima pronađu vakcine i lekove protiv oboljenja izazvanog širenjem moćnog i nepoznatog virusa SARS-CoV-2. Protokoli za lečenje COVID-19 su se menjali svakog meseca pandemije. Umesto starih antivirusnih lekova na bazi kinina sada se koriste favipiravir, avifavir, avigan, areplivir, koronavir i drugi novi i generički eksperimentalni lekovi. Vakcine, koje su bile sintetizovane za primenu protiv Ebola virusa u modifikovanom obliku postale su osnova za rusku vakcinu Sputnik-V.

I u drugim sektorima industrije tehnologije iz 20. veka našle su mnogobrojne primene, na primer u sportskoj industriji (robotika, mehatronika, nanotehnologije).

Otkrića iz oblasti biogeohemije omogučuju stvaranje novih biotehnologija.

Tokom dvadeset sedam godina postojanja časopisa ECOLOGICA u njenu je objavljen veliki broj naučnih radova posvećenih najaktuelnim problemima zaštite životne sredine:

- Zelena ekonomija i zaštita životne sredine,
- Ciljevi razvoja u 3. milenijumu,
- Životna sredina i adaptacija privrede na klimatske promene,
- Uticaj klimatskih promena na životnu sredinu i ekonomiju,
- Inovativne strategije i tehnologije u zaštiti životne sredine,
- Životna sredina i ljudsko zdravlje.

Ovogodišnja naučna konferencija *Četvrta industrijska revolucija – značaj za razvoj zelene ekonomije i zaštitu životne sredine* fokusirana je na mnoge teme povezane sa zelenom ekonomijom i zaštitom životne sredine, koje su uključene u 6 naučnih sekcija:

- Značaj 4. Industrijske revolucije za razvoj zelene ekonomije i cirkularne ekonomije,
- Razvoj pametnih gradova i primena novih tehnologija,
- Organska poljoprivreda i ekoturizam,
- Uloga biogeohemije u razvoju biotehnologija,
- Finansiranje zaštite životne sredine,
- Socijalne dimenzije i pravni aspekti četvrte industrijske revolucije.

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PLENARNA PREDAVANJA I PREDAVANJA PO POZIVU

PLENARY LECTURES AND INVITED LECTURES

FOURTH INDUSTRIAL REVOLUTION AND SUSTAINABLE DEVELOPMENT

Dr Jozefina Beke-Trivunac

ALFA BK university, Belgrade, Serbia

The industrial revolution commonly designates the replacement of human work with machines and technological systems and improves its efficiency. The fourth Industrial Revolution is applying digital technologies to our world, merging the physical, digital, and biological worlds to create both benefits and risks. It represents entirely new ways in which technology becomes embedded within societies, economies, and people. According to Klaus Schwab from World Economic Forum, there are four main effects that the Fourth Industrial Revolution has on business—on customer expectations, on product enhancement, on collaborative innovation, and on organizational forms. Although these new technologies and systems offer great positive potential, they could also harm the natural environment and its resources, human beings, and society.

Energy producing companies are among those with the most influence on both the supply and consumers' side parties, with an almost standard business model comprising upstream and downstream parts of the process. Upstream refers to the material inputs needed for production, while downstream referres to the prodaction and distribution of products. Interaction with nature is robust both at the beginning and at the end of their supply chain processes. These companies are among the leaders in using the latest technologies and digitalization, but they also say that they take care of the sustainability issues related to their business model.

In this text, we analyze the sustainability policies and practice of fifteen largest energy-producing companies from East and South Europe to understand how and where emerging technologies could tackle some of the world's most pressing environmental, economic and social challenges. The analysis is performed under the 17 Sustainable Development Goals (SDGs) umbrella, established by the United Nations General Assembly in 2015, to benchmark global development outcomes for the year 2030. The data are collected from companies' sustainability reports and other similar information available at companies' websites for the last three years. Although there is plenty of evidences that the technologies that belong to the Fourth Industrial Revolution are having a major impact on businesses, they do not affect the traditional business goals and objectives. The starting assumption is that companies' investments in sustainability tend to be focused on areas that are already part of their businesses, retaining some interests in the areas that might benefit wider society.

Keywords: Sustainability policies; Sustainable Development Goals; Energy producing companies; CEE.

THE IMPORTANCE OF SELENIUM AND ZINC IN THE PREVENTION AND TREATMENT OF CERTAIN DISEASES

Emeritus prof. Dr. Larisa Jovanović[1], Prof. Dr. Vadim Ermakov[2]

[1]ALFA BK University, Belgrade, Serbia
[2]Vernadsky Institute of Geochemistry and Analytical Chemistry, RAS, Moscow, Russia

Some aspects of the biological action of selenium and zinc and their influence on viral infections are considered.
The fourth industrial revolution is considered as one of the stages of the evolution of society and the biosphere as a whole. It reflects not only new forms of interaction between man and nature, but also changes in living matter, and the state of sustainable development. The development of the modern biosphere is associated with technogenesis and is accompanied by the fast formation of the technosphere using a new materials and information technologies.
Globalization in all spheres of human activity: industry, trade, transport and tourism led to the globalization of environmental problems (in the 60s of the 20th century) and global climate change (at the end of the 20th century).
The 21st century has become a turning point of the global development of mankind.
The COVID-19 pandemic caused by the global spread of the Corona virus (SARS-2) has led to the termination of cooperation between individual countries and the closure of borders between individual states, even within the European Union, and within individual states (Victoria State in Australia, individual provinces in Italy and Spain).
A global economy burdened by environmental problems and climate change during a pandemic becomes increasingly fragile in the way of depression.
Zinc and selenium play a special role in the processes associated with immunity and blocking bacterial and viral pathologies. Deficiency of zinc and selenium always leads to immunodeficiency. Zinc modulates antiviral and antibacterial immunity and regulates inflammatory responses in humans and animals. Despite the lack of extensive clinical trials, there is evidence that modulation of zinc status may be important in COVID-19.

Keywords: selenium, zinc, viral infections, biological role of supplements, COVID-19.

THE ROLE OF BIOGEOCHEMISTRY IN THE DEVELOPMENT OF BIOTECHNOLOGY

Prof. Dr. V. V. Ermakov[1], Prof. Dr. N. B. Gradova[2], Dr. V. Kovalsky[1]

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Geochemical ecology was founded by the outstanding naturalist of Russia V. V. Kovalsky in the 60s of the last century as a result of the systematic study of the biosphere taxons. It originated at the intersection of natural sciences, being a section of biogeochemistry and general ecology. Currently, its role is constantly increasing due to the technological transformation of the biosphere and the penetration of ecology into all spheres of human life.
Data on the geochemical ecology of organisms are the basis for the regulation of trace elements in the diet of animals and humans, as well as for the industrial production of preparations and feeds enriched with trace elements]. Methods have been developed for artificially changing food chains in agricultural landscapes and reservoirs to increase their productivity. At present time geochemical ecology serves as the basis for innovations in the field of environmental monitoring and diagnostics of microelementhoses (using morphometric methods of indication, chemical elemental composition of hair and other animal tissues, metalothioneins, metaloenzymes, enzyme adaptation, technology for prevention of local and global biogeochemical endemias, remediation of contaminated soils and dumps, etc.).
The theoretical provisions of geochemical ecology are the basis for predictive estimates of the evolution of the chemical composition of organisms and their biogeochemical functions, changes in local and global cycles of chemical elements, and elucidation of the mechanisms of biological action of macro-and trace elements, as well as practical applications in soil science, crop production, animal husbandry, and medicine.

Keywords: biotechnology, geochemical ecology, trace elements, microorganisms, plants, soils.

This study was supported by the Russian Foundation for Basic Research (Project No. 19-05-00054A).

BIOGEOCHEMICAL ENDEMIC DISEASE: UROV KASHIN-BECK PATHOLOGY

Uliana Gulyaeva, Prof. Dr. Vadim Ermakov, Valentina Danilova,
Dr. Sergey Tyutikov and Alexander Degtyarev

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It was conducted the comparative assessment of the levels of content and migration parameters of biologically active chemical elements in the biogeochemical food chains of the main localities of the Urov endemic disease in the Eastern Transbaikalia: rocks-soils-plants-animal hair and milk. The predominant soil-forming rocks in East Transbaikalia are weathering products of Proterozoic carbonated granitoids PR2. The surface rocks consist from granite, granodiorite, diorite quartz diorite, gabbro, norite, gabbro-norite and other. The differentiated polyelement microelementosis with an excess of Sr, Mn, Cr, Ni, in some cases – P, Ba, As, Zn and deficiency of Se, J, Cu, and Mo is typical in Urov biogeochemical provinces of Eastern Transbaikalia against the background territories. Soil landscapes are not much different in content of selenium, but its migration in plants was reduced in places of spread of Urov disease. Parameters of migration of chemical elements in the soil-plant complex reflected on their content in wheat, hair cover of animals and milk cows. The sources of this imbalance are soil-forming rocks, specific conditions of soil formation (accumulation of organic matter in freezing soils of narrow valleys with a high degree of moisture and low flow, and selective concentration by plants). For floodplain soils with a high level of organic matter is characterized by a high content of micromycetes of the genus Fusarium as their species composition and abundance. The data obtained are consistent with the results of research by Chinese scientists on the assessment of the chemical elemental composition of hair in healthy children and with Urov Kashin-Beck pathology and considered as risk factors in the genesis of this endemic disease.

Keywords: biogeochemical endemic, Urov Kashin-Bek disease, soil, plant.

INFLUENCE OF ANTHROPOGENIC FACTOR ON THE ENVIRONMENT. CASE STUDY: COVID-19 PANDEMIC

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In consideration of the fact that the pandemic of the newly identified corona virus (COVID-19 virus SARS-CoV-2) is unfortunately far from over, after nine months from the official proclamation, its previous environmental impacts can still be sublimated.
The impact of the COVID-19 virus pandemic on life on our planet is fascinating, social relations (quarantine measures, physical distancing, etc.), economic decline (collapse of many trade, financial and commodity channels, elimination of a huge number of jobs, etc.) strong impact on social and societal movements but also on the environment. Measures ordered by most governments around the world to mitigate the effects of the pandemic have had an unexpectedly positive impact on nature around the world. At one point, the planet almost stopped for two months, when the borders of most countries were closed, nature then began to proudly appear in full glory in a record short time, and depictions of visible changes caught the media's attention. In this paper, we will try to determine by systematic analysis whether the changes are really so dramatic and what is the impact of the pandemic on air, water and soil pollution, and thus the anthropogenic factor on the state of the environment.
Indicators as quantified information provide a systematic insight that is certainly more far-reaching and comprehensive than the lay observations that have captured the public's attention. The ecological footprint, as the most comprehensive available metric calculation of biological resources, shows that due to the impact of the COVID-19 pandemic, the parameters of this indicator have returned to the level they were ten years ago.
Although the environmental parameters are influenced by many interrelated factors, such as: air temperature, amount and type of precipitation, relief, geological composition of the soil, etc. pandemic has shown that anthropogenic impact is a key factor in environmental change globally.

Keywords: anthropogenic factor, pandemic, COVID-19, environment, pollution.

UTICAJ ANTROPOGENOG FAKTORA NA ŽIVOTNU SREDINU. STUDIJA SLUČAJA: PANDEMIJA COVID-19

prof. dr Mario Lukinović[1], emeritus prof. dr Larisa Jovanović[2]

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[2]ALFA BK Univerzitet, Beograd, Srbija

S obzirom na to da je pandemija novoidentifikovanog korona virusa (COVID-19 virus SARS-CoV-2) nažalost daleko od kraja, nakon devet meseci od zvaničnog proglašenja ipak se mogu sublimirati njeni dosadašnji uticaji na životnu sredinu.
Uticaj pandemije virusa COVID-19 na život na našoj planeti je fascinantan, socijalni odnosi (mere karantina, fizičko distanciranje i sl.), privredni pad (kolaps mnogih trgovinskih, finansijskih i robnih kanala, ukidanje ogromnog broja radnih mesta i dr.) nemaju samo snažan uticaj na socijalna i društvena kretanja već i na životnu sredinu. Mere koje je većina vlada širom sveta naložila kako bi ublažila posledice pandemije, odrazile su se neočekivano pozitivno na prirodu širom sveta. Planeta je gotovo stala na dva meseca, kada su zatvorene granice većine država, priroda je tada u rekordno kratkom vremenu počela ponosno da se pojavljuje u punom sjaju, a prikazi golim okom vidljivih promena zaokupili su medijsku pažnju. U radu ćemo pokušati da sistemskom analizom utvrdimo da li su promene zaista toliko dramatične i koliki je i kakav dosadašnji uticaj pandemije na zagađenje vazduha, vode i zemljišta, a time i antorpogeni faktor na stanje životne sredine.
Indikatori kao kvantifikovane informacije omogućavaju sistemski uvid koji je svakako dalokosežniji i obuhvatniji od laičkih opažanja koja su zaokupila pažnju javnosti. Ekološki otisak kao najopsežniji dostupni metrički obračun bioloških resursa, pokazuje da su se usled uticaja pandemije COVID-19 parametri ovog indikatora vratili na nivo na kojem su bili pre deset godina.
Iako na ekološke parametre utiču mnogi međusobno povezani faktori, kao što su: temperatura vazduha, količine i tip padavina, reljef, geološki sastav tla i sl. pandemija je pokazala da je antropogeni uticaj ključni faktor promena životne sredine na globalnom nivou.

Ključne reči: antropogeni faktor, pandemija, COVID-19, životna sredina, zagađenje.

RE-THINKING GREEN ECONOMY STRATEGY: THE SHIFT TOWARDS REGIONAL PRODUCTION IN THE SLOVAK REPUBLIC

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Major economic sectors face the challenge to further shift towards a green economy. An increasing demand for food products around the globe causes enormous pressure on the environment. Intercontinental transport of agricultural commodities and food products increases the carbon footprint annually. The aim of this article is to support the idea to produce locally and consume locally in order to achieve sustainable economic development being part of the green economy strategy.

In the previous decades, agriculture and food production had been dominant economic sectors in the Slovak republic. Slovakia's regional climate is suitable for growing different agricultural corps. On one side, Slovakia has a great potential to grow and process variety of agricultural products and raising livestock while being self-sufficient, on the contrary, only 40% of foodstuffs are produced domestically. It has been estimated that 820 trucks of foodstuff are daily imported to Slovakia from abroad. Since 2018 up until today, the number of trucks increased over 100 trucks per day. At the same time, similar quantity as locally produced milk which is exported per annum is imported to the country. In order to avoid such anomaly in the future, Slovak republic has to support local consumption. Promoting idea to produce and consume locally, we can significantly reduce GHG emissions caused by transportation and logistics of foodstuffs.

The recent outbreak of infectious pandemic Covid-19 has globally shown, how important agriculture and regional production of foodstuffs are, when import of goods had suddenly become uncertain. Same case applies to the Slovak republic. Regional production is important element of a green economy strategy, which can boost regional employment and ensure high-quality products leading to healthier lifestyle.

Keywords: agriculture, carbon footprint, Covid-19, foodstuff, import.

MICROEXTRACTION - A GREENNES OF ANALYTICAL PROCEDURES

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Significant technological advances have made it possible to introduce modern apparatus in analytical chemistry laboratories and thus simplify, accelerate, and make the step of detection and quantification more economical. With this progress, the bottleneck in the work of one laboratory has become the preparation of samples for instrumental measurement. This step in the overall experimental procedure is often very tedious, time-consuming, and requires the use of various chemicals in huge quantities, all of which are harmful to human health and the environment. In recent years, many research papers have been devoted to improving the sample preparation in terms of better sensitivity, reliability, productivity, miniaturization, and the whole method to become greener. The most significant efforts in this direction have been made in developing microextraction techniques of the sample preparation. Analytical microextractions are the sample preparation procedures in which the analytes are extracted with a tiny volume of the extraction phase (microliters) from a large sample volume in order to purify the sample or concentrate the analyte. Depending on the type of extraction agent, microextraction may be: solid-phase microextraction (SPME) if a small amount of solid sorbent is used, or liquid phase extraction (LPME), if a small amount of liquid solvent is used. Various sample microextraction settings have been developed in recent decades. Ultrasound is widely used to improve interfacial contact, reducing extraction time. Ultrasonic energy provides efficient contact between the two phases, which is a greener alternative to traditional Soxhlet extraction. Alternative extraction techniques are also pressurized liquid extraction (PLE), the so-called Accelerated solvent extraction (ASE) and microwave extraction (MAE). The LPME and SPME processes are suitable for miniaturization, examples being single drop microextraction, dispersive solid-phase microextraction (DSPME), dispersive liquid-liquid microextraction (DLLME), and liquid phase hollow fiber extraction (HFLPME). These methods differ in design, but they all have one thing in common, they use only microvolumes of solid sorbent or organic solvent, thus enabling the green analytical chemistry principle. The use of classical organic solvents as a medium for microextraction also has a green alternative in the form of ionic liquids, deep eutectic solvents, or surfactant solutions. The mentioned solvents enable the greening of classical extraction methods based on the use of chlorinated solvents or aromatic hydrocarbons. The inevitable green alternative is the QuEChERS (quick, easy, cheap, efficient, robust, and safe) extraction method, which consists of extracting the analyte from a homogenized sample using acetonitrile and salt, then purifying the supernatant using a solid phase dispersive extraction technique. This QuEChERS approach is dominantly used in pesticide analysis in laboratories. Future trends in green extraction are directed towards further miniaturization, which will further improve the greenness of analytical procedures.

The development of lab-on-chip and microfluidic systems include the use of disposable solvents/sorbents using mesofluidic platforms. The efforts are being continuously made in evaluating new solvents. Also, new solid phases suitable for use in the selective extraction of target analytes, such as imprinting polymers and nanomaterials, contribute to dramatically reducing the amounts of reagents and energy used and to improve the analytical features of the methods, thereby contributing to the sustainability of laboratories. In general, the greening of laboratory sample preparation procedures by microextraction is a viable alternative to the classical sample preparation procedures used in the past. The evolution of sample preparation procedures is focused not only on the green aspect but also on the simultaneous improvement of the main analytical characteristics of laboratory methods and their practical aspects, including the economy.

Keywords: Dispersive, QuEChERS, SPME, DLLME, ultrasound, solvent, sorbent, ILs, DES.

The possibility of creating a new world-class scientific technological platform is the task of biogeochemists

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The article shows the technical feasibility of creating a new world-class scientific technological platform that can solve the civilization problem - the task of increasing the adaptive potential of a modern person's subscriber to the required level, which should ensure him a stable existence and development in a modern environment. Assumptions are made about the possible goals and objectives of scientists biogeochemists when using the opportunities to work on this platform and future customers and consumers of the results of scientific research.

Keywords: human adaptive potential, environmental degradation, emergency situations, biogeochemical studies.

BIOASSAY OF TOXICITY OF SYNTHETIC DETERGENTS USING PLANT SEEDLINGS: NEW EXPERIMENTAL DATA ON PHYTOTOXICITY

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Abuse of synthetic detergents (SDs) may cause chemical pollution of the environment, adverse effects on the ecosystem, and risks of human health. It grows the emerging concern on potential toxicity of SDs.
The previous experiments and publications of one of the co-authors discovered toxicity of synthetic surfactants and detergents to plants as it was shown using plant seedlings as test organisms in bioassay experiments.
Our bioassay protocol is to take advantage of lentil (*Lens culinaris*) seeds for the phytotoxicity tests. The goal was to answer the question, whether the synthetic detergents – namely, “Blue moon” liquid laundry detergent (“Blue moon”-LLD), “Laska” liquid laundry detergent (“Laska”-LLD) and “Tide” powder laundry detergent (“Tide”-PLD) – are toxic in the test with plant seedlings.
The SDs test solutions (0.1% and 0.5%) were diluted from 1.0% SDs aqueous solution. The ultrapure water was used as blank control (0.0%). 30 seeds were sowed in each Petro dish, totally 12 dishes. Each group in triplicate was added with 20 mL test solution at 0.0%, 0.1%, 0.5% and 1.0%, respectively. All test samples were incubated in the dark at 20.0±1.5 °C. After 72 h or 96 h, the number of germinated seeds was counted, and the root length was measured.
For details, we would illustrate an example with one of the detergents which were tested. The detergent that “Blue moon”-LLD was phytotested by *Lens culinaris*. It presents that the percent germination of seed (PGS, ca. 0%-80%) and the root length (RL, ca. 0-5 mm) after 72-h, and PGS (ca. 0%-90%) and RL (ca. 0-9 mm) after 96 h. Both germination and root elongation tests showed a phytotoxic effect on *Lens culinaris*.
After 72 hours of incubation, the average root length was 2.2 mm at 0.1% “Blue moon”-LLD solution, 0.0 mm at 0.5%, and 0.0 mm at 1.0% (in control, it was 5.2 mm).
After 96 hours of incubation, the average root length was 2.6 mm at 0.1% “Blue moon”-LLD solution, 0.0 mm at 0.5%, and 0.0 mm at 1.0% (in control, 9.0 mm).
The results obtained are in agreement with the previous experiments conducted by S.A. Ostroumov and his students and co-workers. These publications were well-cited by international researchers.
The new data confirmed the results of these experiments and provided further support and confirmation to the conclusions of the previous publications of S. Ostroumov that detergents are phytotoxic (including phytotoxicity to higher plants) and provide a serious environmental hazards which is more serious than it was thought before he published his series of publications on ecotoxicology of detergents and surfactants.
Synthetic detergents inhibit seed germination and root elongation of higher terrestrial plants. This study demonstrated the usefulness of *Lens culinaris* bioassays for the qualitative assessment of toxicity of SDs. The bioassay protocol is a potential and promising alternative to toxicological analysis.

Keywords: environmental hazards, toxicity, detergent, plant seedlings, germination, *Lens culinaris*.

STATE AND DEVELOPMENT OF ORGANIC AGRICULTURE IN BULGARIA

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The bioeconomy covers those parts of the economy that include renewable biological resources (land and marine ecosystems and the services they provide), all sectors of primary production that produce and use biological resources and all other industrial sectors that include biological resources for food production, feed, organic products, energy and services. It includes an extremely wide variety of productions, products, activities and services related to the use and management of biological resources and has very great prospects for development. Given the depletion of fossil resources, climate change and the world's growing population, sustainable and resource-efficient strategies are increasingly being sought to ensure the well-being of society. The bioeconomy is a response to these challenges, as it enables the use of biological resources and innovative technologies to replace unsustainable products and processes based on fossil resources with more sustainable ones. An important goal of the bioeconomy, in addition to reducing the consumption of non-renewable resources in production, is to reduce harmful emissions of carbon dioxide and the negative impact of industrial processes on the environment. The bioeconomy not only replaces fossil resources with renewable raw materials, but also aims to increase resource efficiency through cascading and life cycle management. This is a good way to improve the resilience of the economy.

One of the very important sectors in which organic production can develop, as part of the bioeconomy, is organic farming. Organic farming is a form of specific cultivation of plants and animals, plant and animal products, their processing into organic food and their sale on the market. According to the European Plan for Organic Food and Agriculture, organic farming is a comprehensive production management system that promotes and strengthens the sustainability of the agrosystem, biological cycles and soil biological activities. It is carried out through the use of agronomic, biological and physical mechanical methods, as a counterbalance to the use of synthetic materials to perform a certain function within the system. Organic farming is a comprehensive system for management of agriculture and food production, which combines best practices in terms of environmental protection and natural resources, applies high standards and methods for the production of food, feed and more organic products, as well as animal welfare, natural substances and processes are used in accordance with the requirements and preferences of consumers.

The report examines the nature of organic production, EU policy in the field of organic farming, the strategy and action plan for its development in Bulgaria, its condition and the results achieved, as well as weaknesses and unresolved issues. The report also reveals the essence of the bioeconomy and its key role in the transition to sustainable, smart and efficient economic growth in Bulgaria.

Keywords: bio-economy, organic farming in Bulgaria, weaknesses in the development of organic farming

RECLAMATION OF SOIL POLLUTED BY GAS CONDENSATE

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Gas condensate is a mixture of liquid hydrocarbons (C5H12 + higher homologs), which is separated from natural gases during the operation of a gas condensate deposit as a result of a decrease of stratum pressure and temperature. Gas condensate can enter into the environment not only at emergencies on condensate lines but also at chronic blowing of technologic equipment by means natural gas at booster pressure stations, which providing rated pressure of main gas pipe as stratum pressure of gas decreases. Gas condensate entering on soil produces an effect of «technogenic desert», which is characterized by the complete absence of vegetation and soil erosion leading to the formation of ravines. As a result, a real threat for the geological stability of engineering-technic structures of gas industry can occur. For preventing this undesirable phenomenon, it is necessary to perform soil reclamation by the regeneration vegetation on soil to protect it from erosion. The aim of this study was to develop an approach to the reclamation of soils polluted by gas condensate in the territory of booster compressor station with the use of biocompost, which was obtained by the fermentation of peat with manure (4:1) and enrichment by microorganisms and nutrients. The test area was located in the territory of a booster compressor station in the Stavropol region (45○03' N, 43○16' E; Russia), where soil was polluted by gas condensate to cause a permanent specific smell of the gasoline and kerosene components of this substance in atmospheric air and the complete absence of vegetation from this area. For reclamation of polluted soil, the biocompost (4 and 8 kg/m2) was covered with agitation into the layer (0-6 cm). For producing thick herbage and dense turf, which protects soil from erosion, the sowing of perennial cereal grasses mixture (30 g of seeds per 1 m2) was performed. The control variant was without the application of biocompost. The analysis of the quantity of gas condensate hydrocarbons in the surface layer of soil was carried out by infrared spectrometry method, at the extraction of substances from soil by carbon tetrachloride (CCl4). For the assessment of soil reclamation effectiveness during the observation period (6 weeks), the dehydrogenase and catalase enzyme activities analysis was carried out in the soil. It was found what catalase and dehydrogenase activities increased by 2-3 and 6-9 times, respectively, for different biocompost doses, as compared with control variant. The increase in catalase and dehydrogenase activities at the biocompost application confirm the beginning of soil reclamation process with the direct participation of these enzymes. The results of the sowing and growing of grasses mixture showed that the plant biomass at biocompost doses 4 and 8 kg/m2 was more by 9 and 17 times as compared with control variant. Meanwhile, during the observation period, the initial quantity of gas condensate hydrocarbons in soil (2-5 g/kg) decreased by 10-25%. It should be noted that the chronic pollution of soil by gas condensate will requires the permanent monitoring of the state of the herbage, and at deterioration of the herbage state will need to renew the application of biocompost and the sowing and growing of grasses mixture.

Keywords: gas condensate, soil pollution, reclamation, biocompost, perennial cereal grasses, enzyme activity, plant biomass, gas condensate hydrocarbons quantity.

THE IMPORTANCE OF THE FOURTH INDUSTRIAL REVOLUTION IN IMPROVING THE MINERAL SECTOR BUSINESS AND IMPROVEMENTS OF MINERAL ECONOMY

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The improvement of the mineral sector business and the successful functioning of the country's mineral economy is directly linked to the relevant scientific and technological inventions and practically applicable modern information and digital technologies. The latest stage of scientific and technological development, covered by the term Industry 4.0, covers the reform and modernization of industrial production, which in a specific way, in the information and digital sphere, directly reflects on the production and functional aspects in the country's mineral economy and mineral sector. Modern business conditions and complexity of dynamic developments in the specific production market of mineral raw materials, requires an understanding of the forms and modes of application of the latest digital-information-management achievements in all segments of mineral processing from geological exploration, through exploitation, preparation and processing to market valorization of various metallic, non-metallic and energy minerals. The use of the benefits of digitization, digital business and digital economy, as well as modern technologies for the automation of production, processing and exchange of various geological data, is particularly influential on project activities.

From the point of view of the management of geological project activities, the most important initial links of material production are: (i) Preparation; (ii) Design and (iii) Realization of the geological project. The preparation requires the prior collection of a very large number of necessary geological baseline information on the geological structure of the prospecting area, based on data from previous geological surveys and studies, systematized and structured in appropriate databases. The design of the geological project is directly dependent on the relevant software packages, which in particular serve: (a) Integral processing and (b) Interpretation of the collected data. Modern software packages are unavoidable in the part with the assessment of the potential of the exploration area for a certain mineral raw material, based on of thousands of relevant geological data. In doing so, designing investigative works, e.g. well, must also be accompanied by an economic cost calculation, with a comparative economic evaluation of the value of the expected mineral reserves. During the realization of the geological activities, the most significant impact is the modern digital revolution, that is, the connection that exists between digital and physical assets, within cyber-physical systems. In practical terms, it directly relates to: (a) the direct execution of exploratory geological works; and (b) Design monitoring of the implementation of exploratory geological works.

From the point of view of the management of mining and technological project activities, the application of digitization and modern cyber-physical systems, especially highly productive and expensive automated machinery equipped with modern management software, is very important. This automated mechanization enables successful exploitation process and is very important for achieving the planned volume of projected exploitation on a daily, monthly and annual basis. Consequently, it directly affects the natural and economic effects of production, that is, the provision of planned and projected quantities for market placement and the needs of numerous industries for mineral resources of enterprises in the mineral sector.

Keywords: The fourth industrial revolution, mineral economy, mineral sector.

ZNAČAJ ČETVRTE INDUSTRIJSKE REVOLUCIJE U POBOLJŠANJU POSLOVANJA MINERALNOG SEKTORA I UNAPREĐENJA MINERALNE EKONOMIJE

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Unapređenje poslovanja mineralnog sektora i uspešnost funcionisanja mineralne ekonomije zemlje je direktno povezano sa odgovarajućim naučno-tehnološkim pronalascima i praktično primenjivim savremenim informatičkim i digitalnim tehnologijama. Najnovija etapa naučno-tehnološkog razvoja, obuhvaćena terminom Industrija 4.0, obuhvata reformu i modernizaciju industrijske proizvodnje, koja se na specifičan način, u informatičkoj i digitalnoj sferi, direktno odražava na proizvodne i funkcionalne aspekte u mineralnoj ekonomiji i mineralnom sektoru zemlje. Savremeni uslovi poslovanja i složenost dinamičkih kretanja na specifičnom proizvodnom tržištu mineralnih sirovina, zahteva sagledavanje oblika i modusa primene najnovijih digitalno-informatičko-upravljačkih dostignuća u svim segmentima treiranja mineralnih sirovina od geoloških istraživanja, preko eksploatacije, pripreme i prerade do tržišne valorizacije različitih metaličnih, nemetaličnih i energetskih mineralnih sirovina. Na projektne aktivnosti poseban uticaj ima korišćenje prednosti digitalizacije, digitalnog poslovanja i digitalne ekonomije, kao i savremenih tehnologija za automatizaciju proizvodnje, obradu i razmenu različitih geoloških podataka.

Sa stanovišta menadžmenta geoloških projektnih aktivnosti, kao najvažnije početne karike materijalne proizvodnje, izdvajaju se: (i) Priprema; (ii) Izrada i (iii) Realizacija geološkog projekta. Priprema zahteva prethodno prikupljanje veoma velikog broja potrebnih polaznih geoloških informacija o geološkoj građi istražnog produčja, a na osnovu podataka prethodnih geoloških istraživanja i proučavanja, sistematizovanih i strukturiranih u odgovarajućim bazama podataka. Izrada geološkog projekta je direktno zavisna od odgovarajućih softverskih paketa, koji naročito služe: (a) Integralnoj obradi i (b) Interpretaciji prikupljenih podataka. Savremeni softverski paketi su nezaobilazni u delu sa ocenom potencijalnosti istražnog prostora na određenu mineralnu sirovinu, na osnovu više hiljada releventnih geoloških podataka. Pri tome projektovanje istražnih radova, npr. bušotina, mora pratiti i ekonomska kalkulacija troškova, uz komparativnu ekonomsku ocenu vrednosti očekivanih mineralnih rezervi. Tokom realizacije geoloških aktivnosti najznačajniji je uticaj savremene digitalne revolucije, odnosno veze koja postoji između digitalnih i fizičkih sredstava, u sklopu kibernetičko-fizičkih sistema. Ona se u praktičnom smislu direktno odnosi na: (a) Neposredno izvođenje istražnih geoloških radova; i (b) Projektantsko praćenje realizacije istražnih radova.

Sa stanovišta menadžmenta rudarskih i tehnoloških projektnih aktivnosti veoma je važna primena digitalizacije i savremenih kibernetsko-fizičkih sistema, posebno visoko produktivne i skupe automatizovane mehanizacije opremljene savremenim upravljačkim softverima. Ova automatizovana mehanizacija omogućuju uspešno odvijanje eksploatacionog procesa i veoma je važna za ostvarivanje planiranog obima projektovane eksploatacije na dnevnom, mesečnom i godišnjem nivou. Posledično ona direktno utiče na naturalne i ekonomske efekte proizvodnje, odnosno obezbeđenje planiranih i projektovanih količina za tržišni plasman i potrebe brojnih privrednih grana za mineralnim sirovinama preduzeća mineralnog sektora.

Ključne reči: četvrta industrijska revolucija, mineralna ekonomija, mineralni sektor.

ECOLOGICAL ASPECTS AND ENVIRONMENTAL PROTECTION IN THE CONSTRUCTION OF SPORTS FACILITIES

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It was only at the turn of the millennium that humanity became aware that human irresponsibility and constant pollution of nature grew with the development of society and technology and reached the level of an ecological crisis of global proportions. There are three main reasons for harmful changes in the environment: population growth, technology development and rising living standards. Some scientists claim that the process is irreversible, but most agree that the key moment for decisive measures is to prevent further destruction of the planet. The World Football Organization is committed to the idea of sustainable development with the aim of preserving the nature and future of football, through the protection of the beauty, diversity and quality of life on the planet. In the summary of the executive plan for the organization and construction of facilities for the World Cup in Qatar 2022, FIFA insists on respecting all ISO 14000 environmental standards, so that future generations can share a greener planet. Caring for the environment is the basis of the strategy, which includes high-class environmental solutions. Football is without a doubt the most popular sport, which gathers the largest number of spectators. As such, it should take on a much higher degree of social responsibility, especially in the field of environmental protection and human health. FIFA, as the most responsible international football organization, has recognized and accepted this type of responsibility and is trying to spread awareness of the importance of environmental protection. Among the football players (Messi, Ronaldo, Modrić, Ramos, Lewandosvki ...), idols of the fan masses, we should look for "roll models", who could be "ambassadors of environmental protection". Their messages are stronger than the messages of politicians, ordinary citizens and scientists, and if they are clear, a global unity of environmental protection can be built on them.

Keywords: sports objects, multifunctionality, ecological standards, environment protection.

EKOLOŠKI ASPEKTI I ZAŠTITA ŽIVOTNE SREDINE U IZGRADNJI SPORTSKIH OBJEKATA

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Čovečanstvo je tek na prelazu između dva milenijuma postalo svesno da su ljudska neodgovornost i konstantno zagađivanje prirode rasli sa razvojem društva i tehnologija i dostigli nivo ekološke krize globalnih razmera. Tri su osnovna razloga štetnih promena životne sredine: rast stanovništva, razvoj tehnologije i porast životnog standarda. Neki naučnici tvrde da je proces ireverzibilan, ali većina je saglasna da je ključni momenat za odlučne mere za sprečavanje daljeg uništenja planete. Svetska fudbalska organizacija je posvećena ideji održivog razvoja sa ciljem očuvanje prirode i budućnost fudbala, kroz zaštitu lepote, različitost i kvaliteta života na planeti. U rezimeu izvršnog plana za organizaciju i izradu objekata za Prvenstvo Sveta u Kataru 2022 FIFA insistira na poštovanju svih standarda ISO 14000 zaštite životne sredine, kako bi generacije koje dolaze mogle da dele zeleniju planetu. Briga o okolini je osnova strategije, koja podrazumeva rešenja zaštite životne sredinevisoke klase. Fudbal je bez dileme najpopularniji sport, koji okuplja najveći broj gledalaca. Kao takav treba da preuzme znatno veći stepen društvene odgovornosti, naročito u sferi zaštite životne sredine i zaštite zdravlja ljudi. FIFA kao najodgovornija međunarodna fudbalska organizacija je prepoznala i prihvatila tu vrstu odgovornosti i pokušava da širi svest o značaju zaštite životne sredine. Među fudbalerima (Mesi, Ronaldo, Modrić, Ramos, Levandovski...), idolima navijačkih masa, treba tražiti “rol modele”, koji bi mogli postati “ambasadori zaštite životne sredine”. Njihove poruke su snažnije od poruka političara, običnih građana i naučnika, te ako su jasne na njima se može graditi globalno jedinstvo u cilju zaštite životne sredine.

Ključne reči: sportski objekti, multifunkcionalnost, ekološki standardi, zaštita životne sredine.

Sekcija 1

ZNAČAJ 4. INDUSTRIJSKE REVOLUCIJE ZA RAZVOJ ZELENE EKONOMIJE I CIRKULARNE EKONOMIJE

Section 1

SIGNIFICANCE OF THE 4TH INDUSTRIAL REVOLUTION FOR THE DEVELOPMENT OF THE GREEN ECONOMY AND CIRCULAR ECONOMY

ZNAČAJ ČETVRTE INDUSTRIJSKE REVOLUCIJE ZA RAZVOJ ZELENE EKONOMIJE

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Ekonomski napredak u svim zemljama dugo je bio vezivan za otkrivanje i/ili osvajanje novih geografskih teritorija i pronalaženje novih sirovinskih resursa
i izvora energije. Tek sa pojavom industrijskih revolucija, postalo je jasno da ljudi mogu izmisliti nove materijale i nove izvore energije. Pored prirodnih sirovina i energetskih resursa, znanje postaje veoma bitan resurs.

Četvrta industrijska revolucija ima potencijal da podigne nivo globalnog rasta i da poboljša kvalitet života ljudi kroz sve delatnosti u svim delovima sveta, ali postoji i opravdana zabrinutost zbog posledica „tehnološkog darvinizma“, odnosno šta će biti sa onima koji ne uspeju da uskoče u ovaj „Voz 4.0“. Svaka epoha u razvoju ljudskog društva, pa i ova, donosi i prednosti i nedostatke, ali cilj je uvek isti: stvoriti ekonomiju i novu industrijsku strukturu zasnovanu na strategiji održivog razvoja.

Sirovinski resursi, i energija dugotrajnom upotrebom se troše, a kod znanja sve je suprotno. Što ga više koristimo, više ga imamo. Njime suštinski menjamo odnos prema trošenju prirodnih resursa, prema prirodi samoj, prema pojedincu i društvu u celini, ujedno prihvatamo i novi sistem vrednosti. Moramo shvatiti da nam je priroda partner, a ne predmet izrabljivanja i besomučnog trošenja prirodnih resursa. Zelena ekonomija se osniva na primeni obnovljivih resursa, organskoj proizvodnji, reciklaži otpada sa ciljem štednje prirodnih resursa.

Savremene tehnologije, nova organizacija proizvodnje, nova tržišta zelene ekonomije otvaraju novu fazu društvenog razvoja u eri 4. Industrijske revolucije. Da bi korist od četvrte industrijske revolucije bila što univerzalnija, neophodno je veliku pažnju posvetiti ekološkom informisanju, ekološkom obrazovanju i telekomunikacijama.

Četvrta industrijska revolucija – industrija 4.0 je značajna za razvoj zelene ekonomije, jer nju pokreću nanotehnologije, bioinženjering, veštačka inteligencija i ostale napredne tehnologije. Ona uveliko osvaja mnoge zemlje u kojima brojne industrije, javna uprava i ostali servisi bivaju digitalizovani. Na taj način menja se način života, način na koji radimo, komuniciramo i razmenjamo informacije. Digitalizacija procesa proizvodnje podrazumeva primenu savremenih tehnologija kompjuterskog inženjeringa u svim fazama savremenog proizvodnog procesa – od generisanja ideje o novom proizvodu, testiranja koncepta, izbora materijala, razvoja proizvoda, analize tržišta do organizacije i realizacije proizvodnje, kontrole procesa i pružanja usluga marketinga i distribucije proizvoda.

Ključne reči: četvrta industrijska revolucija, zelena ekonomija, nauka, tehnologija, komunikacija, inovacije.

THE IMPORTANCE OF THE FOURTH INDUSTRIAL REVOLUTION FOR THE DEVELOPMENT OF A GREEN ECONOMY

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Economic progress and wealth were linked to discovering and/or conquering new geographical territories and finding new materials and sources of energy. Only with the advent of industrial revolutions it became clear that people could invent new materials and new sources of energy, and with the technological revolution, it was evident that, aside from natural raw materials and energy, knowledge became a resource. The Fourth Industrial Revolution has the potential to raise the level of global growth and improve the quality of people's lives across all industries all over the world, but there are justifiable concerns about the consequences of "technological Darwinism", or what will happen to those who fail to jump on "the Industry 4.0 train". Every epoch in the development of human society, including this one, has both advantages and disadvantages, but the goal is always the same: to create an economy and a new industrial structure based on a sustainable development strategy.

Raw materials, materials and energy are consumed by long-term use, while it is the opposite with knowledge. The more we use it, the more we have it. It essentially changes the attitude towards the consumption of natural resources, towards nature itself, towards the individual and the society as a whole, and at the same time, it changes our value system. We must understand that nature is our partner, not our slave. Today, anyone can access any IT product at any time, regardless of their location, which involves a two-way exchange of information between individuals and computer programs (systems) on many topics, including the green economy. Modern technology, new production organization and new green economy markets are opening a new phase of social development, but certainly a different one - an era of green economy issues and problems. In order to make the benefits of the Fourth Industrial Revolution as universal as possible, great attention must be paid to environmental information, environmental education and telecommunications.

The Fourth Industrial Revolution - Industry 4.0 is significant for the development of a green economy as it is powered by nanotechnology, neurotechnology, artificial intelligence and other advanced technologies. It is spreading to many countries where numerous industries, public administration and other services are being digitized, which is affecting our lifestyle and the way we work and treat each other. The digitalization of the production process involves the application of modern technologies in all stages of production of a new product - from generating the idea of a new product, testing the concept, selecting materials, product development, market testing, commercialization to the organization and realization of production, process control and service delivery.

Keywords: fourth industrial revolution, green economy, science, technology, communication, innovation.

RELACIJE MINERALNE EKONOMIJE, ZELENE EKONOMIJE I CIRKULARNE EKONOMIJE

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Savremeno funkcionisanje mineralnog sektora zemlje u globalnim i konkurentskim uslovima praćeno je delovanjem složenih ekonomskih faktora, koji pripadaju različitim specifičnim i specijalističkim ekonomskim uticajnim aspektima. Za metalične, nemetalične i energetske mineralne sirovine prvenstveno je značajna mineralna ekonomija, sa ekonomskim zakonitostima materijalne proizvodnje u oblasti geoloških istraživanja, eksploatacije, pripreme i prerade mineralnih sirovina, do njihovog konačnog pojavljivanja na zahtevnom i složenom mineralnom tržištu. Osim generalnih ekonomskih karakteristika mineralne ekonomije, postoje i posebne ekonomske specifičnosti, koje prate svaku od tri navedene grupe mineralnih sirovina. Na putu cirkulisanja elemenata proizvodnje u zatvorenom ekonomskom ciklusu obrta, pojavljuju se i dodatni uticaji novijih i specifičnijih ekonomskih pravaca, kakve su zelena ekonomija i cirkularna ekonomija.

Zelena ekonomija, prema bazičnim postavkama, obuhvata aktivnosti, koje se vrše kroz: (a) smanjenu emisiju ugljenika; (b) ostvarivanje energetske efikasnosti i efikasnosti trošenja resursa; i (c) održavanje biološke raznovrsnosti i opstanka ekosistema. Navedeni elementi zelene ekonomije se na specifičan način odražavaju na geološka istraživanja i eksploataciju, odnosno materijalnu proizvodnju metaličnih, nemetaličnih i energetskih mineralnih sirovina u mineralnom sektoru. U kompletnoj analizi mogu se izdvojiti pet posebno izraženih aspekata uticaja, i to: (a) redukovanje proizvodnje mineralnih sirovina, kao posledica primene koncepta održivosti; (b) promena uslova proizvodnje i korišćenja mineralnih sirovina usled ekoloških zahteva; (c) dugoročno smanjenje i ukidanje proizvodnje fosilnih goriva; (d) povećanje troškova proizvodnje usled preduzimanja mera zaštite životne sredine i rekultivacije; i (e) održavanje prozvodnje ekološki pozitivnih mineralnih sirovina, a smanjenje prozvodnje ekološki negativnih mineralnih sirovina.

Većina proizvodnih procesa u ranijem periodu ekspanzivnog rasta ekonomije, odvijala se po principima tzv. linearne ekonomije, bazirane na linearnom kretanju materije, kroz klasični proizvodni koncept “uzmi-napravi/koristi-odloži“, ili „proizvodni resurs-proizvod-otpad“. Linearna ekonomija je rezultirala stvaranjem relativno velikih količina neadekvatno tretiranog i odlaganog otpada i ispuštanja različitih otpadnih materija, koje su takođe bile prisutne u proizvodnji u mineralnom sektoru. Shodno osnovnom zahtevu za efikasnijim korišćenjem proizvodnih resursa, nastao je koncept cirkularne ekonomije po novom modelu „proizvod – otpad – proizvod“ ili „proizvedi – upotrebi – proizvodi“. Pri tome se kao osnovni izvor ekonomskog rasta pojavljuje veća ponovna upotreba mineralnih materijala iz proizvoda koji su završili životni ciklus, a manje korišćenje novih mineralnih resursa. Uticaj cirkularne ekonomije na mineralnu ekonomiju, s obzirom na specifičnosti materijalne proizvodnje metaličnih, nemetaličnih i energetskih mineralnih sirovina, odlikuje niz specifičnosti. Predmetni uticaj i relacija se može pratiti sa: (a) proizvodnog stanovišta, odnosno neposredne realizacije proizvodnog procesa eksploatacije, pripreme i prerade mineralne sirovine; (b) stručnog geološko-rudarsko-tehnološkog stanovišta, u polaznom analitičkom razmatranju ležišta mineralne sirovine; i (c) stanovišta reciklaže proizvoda sa mineralnim komponentama.

Ključne reči: Mineralna ekonomija, zelena ekonomija, cirkularna ekonomija, relacije.

RELATIONS BETWEEN MINERAL ECONOMY, GREEN ECONOMIES AND CIRCULAR ECONOMIES

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The modern functioning of the country's mineral sector in global and competitive conditions is accompanied by the operation of complex economic factors, which belong to different specific and specialist economic influential aspects. For metallic, non-metallic and energy mineral resources, mineral economy is of primary importance, with the economic laws of material production in the field of geological exploration, exploitation, preparation and processing of mineral resources, until their final appearance on the demanding and complex mineral market. In addition to the general economic characteristics of the mineral economy, there are also specific economic specifics, which accompany each of the three groups of mineral resources mentioned. On the path of circulating production elements in the closed economic cycle of crafts, additional influences of newer and more specific economic directions, such as green economy and circular economy, are emerging.

The green economy, by baseline, encompasses activities carried out through: (a) reduced carbon emissions; (b) energy and resource efficiency; and (c) maintaining biodiversity and ecosystem survival. These elements of the green economy reflect in a specific way on geological exploration and exploitation, ie material production of metallic, non-metallic and energy mineral resources in the mineral sector. In the complete analysis, five particularly pronounced aspects of impact can be identified, namely: (a) reducing the production of mineral resources as a consequence of applying the concept of sustainability; (b) changing conditions of production and use of mineral resources due to environmental requirements; (c) long-term reduction and cessation of fossil fuel production; (d) increase in production costs due to environmental and recultivation measures; and (e) maintaining the production of environmentally-friendly mineral resources while reducing the production of environmentally-negative mineral resources.

Most of the production processes in the earlier period of the expansive growth of the economy, took place on the principles of the so-called. linear economies, based on the linear movement of matter, through the classic production concept of take-it-do/use-delay, or "production resource-product-waste". The linear economy has resulted in the generation of relatively large quantities of inadequately treated and disposed waste and the discharge of various waste materials, which were also present in production in the mineral sector. In accordance with the basic demand for more efficient use of production resources, the concept of circular economy was created according to the new model "product - waste - product" or "produce - use - products". The main source of economic growth is greater reuse of mineral materials from products that have completed the life cycle, and less use of new mineral resources. The influence of the circular economy on the mineral economy, given the peculiarities of the material production of metallic, non-metallic and energy mineral resources, is characterized by a number of specificities. The impact and relationship in question can be traced from: (a) the production point of view, that is, the direct realization of the production process of the exploitation, preparation and processing of mineral resources; (b) an expert geological, mining and technological standpoint, in the initial analytical consideration of the mineral deposit; and (c) recycling points for products with mineral components.

Keywords: Mineral economy, green economy, circular economy, relations.

OBNOVLJIVI IZVORI ENERGIJE KAO OSNOVNI FAKTOR RAZVOJA ZELENE EKONOMIJE I ODRŽIVE INDUSTRIJE

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Ekonomska stabilnost zemlje se obično meri ekonomskim rastom i razvojem iste. U ekonomskom i privrednom razvoju jedne zemlje veliku ulogu ima industrisjki sektor, i u okviru njega energetski sektor. Električna energija je pokretač svih privrednih aktivnosti, proizvodnih i uslužnih. Međutim, proizvodnja energije i ekonomski razvoj svetske ekonomije se većim delom baziraju na upotrebi fosilnih goriva (ugalj, nafta, zemni gas). Ekonomski razvoj i industrijska proizvodnja zasnovani na upotrebi neobnovljivih resursa imaju veoma negativne posledice po životnu sredinu. S obzirom na velike ekološke probleme i posledice koje dosadašnji razvoj ima po životnu sredinu, nužan je transfer tradicionalne ekonomije u zelenu ekonomiju kao i transfer tradicionalne industrije u održivu industriju. Obnovljivi izvori energije imaju značajnu ulogu u tom procesu i značajan potencijal za unapređenje razvoja čovečanstva. Energija dobijena iz obnovljivih izvora može olakšati pristup čistoj i bezbednoj energiji i dati podsticaj za društveni i ekonomski razvoj, doprinoseći razvoju zelene ekonomije i održive industrije.

Ključne reči: Obnovljivi izvori energije, Zelena ekonomija, Održiva industrija

RENEWABLE ENERGY SOURCES AS A BASIC FACTOR OF GREEN ECONOMY AND SUSTAINABLE INDUSTRY DEVELOPMENT

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A country's economic health can usually be measured by looking at that country's economic growth and development. Industrial and energy sector have an important role In the economic development of a country. Electricity is the driver of all economic activities, production and service. However, energy production and economic development of the world economy are largely based on the use of fossil fuels (coal, oil, natural gas). Economic development and industrial production based on the use of non-renewable resources have very negative environmental consequences. Given the major environmental problems and environmental consequences of the past, the transfer of the traditional economy to the green economy and the transfer of the traditional industry to a sustainable industry is necessary. Renewable energy plays a significant role in this process and a significant potential for advancing human development. Renewable energy can facilitate access to clean and secure energy and provide an incentive for social and economic development, contributing to the development of a green economy and sustainable industries.

Key words: Renewable Energy, Green Economy, Sustainable Industry

ZELENA EKONOMIJA I ODRŽIVO KORIŠĆENJE PRIRODNIH RESURSA

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Globalne klimatske promene su poslednjih nekoliko decenija veoma uočljive, kao i njihove posledice na celokupno čovečanstvo. Na žalost, one su posledica nekontrolisane eksploatacije fosilnih goriva, bez obzira da li se radi o čvrstom, tečnom ili gasovitom obliku i konstantne deforestacije. Put izlaza zaustavljanjem ovih nepovratnih procesa destrukcije moguće je pronaći u razvoju i korišćenju obnovljivih izvora energije, odnosno unapređenju energetske efikasnosti i održivom korišćenju prirodnih resursa. Jedino tako je moguće očuvanje prirodnih resursa, što je zapravo i jedan od osnovnih ciljeva zelene ekonomije koja podrazumeva široku primenu obnovljivih izvora energije uz što manju emisiju štetnih materija u okolnu sredinu. Takođe, unapređenje energetske efikasnosti svakako predstavlja jedan od preduslova industrijskog razvoja jer direktno utiče na konkurentnost privrede. Uvažavajući izneto, u radu se analizira pitanje prirodnih resursa kao nosioca razvoja jedne privrede i neminovnosti održivog korišćenja tih resursa, ali i mogućnosti za razvoj zelene ekonomije u pojedinim lokalnim samoupravama, posebno naglašavajući model zelenog razvoja u oblasti korišćenja vodnih resursa. Posledice sadašnjeg, neodrživog korišćenja prirodnih resursa nemoguće je predvideti sa potpunom izvesnošću, ali ublažavanje tih posledica se mora posmatrati kao investicija kako bi se izbegli rizici sa veoma ozbiljnim posledicama u godinama koje su pred nama.

Ključne reči: zelena ekonomija, prirodni resursi, održivi razvoj.

GREEN ECONOMY AND SUSTAINABLE USE OF NATURAL RESOURCES

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Global climate changes in the past decades are very noticeable, as well as their implications for all humankind. Unfortunately, they are the result of uncontrolled exploitation of fossil fuels, regardless it is a solid, liquid or gaseous form and constant deforestation. A way to stop these irreversible processes of destruction can be found in the development and use of renewable energy sources or improving energy efficiency and sustainable use of natural resources. Only thus can the preservation of natural resources, which is actually one of the main objectives of green economy that includes wide application of renewable energy sources with the lowest possible emission of harmful substances into the environment. Also, the improvement of energy efficiency certainly is one of the prerequisites of industrial development because it directly affects the competitiveness of the economy. This paper analyzes the question of natural resources as a carrier of development of an economy and the inevitability of sustainable use of these resources, and opportunities for the development of a green economy in some local governments, particularly highlighting the models of green development in the use of water resources. The consequences of the current, unsustainable use of natural resources, it is impossible to predict with absolute certainty, but mitigate those consequences must be viewed as an investment in order to avoid the risk of very serious consequences in the years to come.

Keywords: green economy, natural resources, sustainable development.

ZELENA EKONOMIJA I STRATEŠKA PARTNERSTVA

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Globalno poslovanje sve više pred preduzeća stavlja potrebu strateškog povezivanja u svim oblastima uključujući i zelenu ekonomiju. Prednosti sklapanja strateških partnerstava su obostrane, kako za preduzeća iz visoko razvijenih zemalja koja teže da, po pravilu, dobru tržišnu poziciju poboljšaju korišćenjem novih mogućnosti na ovim tržištima (lakši pristup novim i povoljnim nabavnim i prodajnim tržištima), tako i za ona iz manje razvijenih zemalja kao što je Srbija. Privlačenje i zadržavanje direktnih stranih ulaganja glavni je cilj mnogih zemalja, budući da je sasvim jasno da ona imaju važnu ulogu u stvaranju novih radnih mesta, povećanju izvoza, prenošenju tehnologije i znanja u poslovanju, ali i podizanja nivoa svesti o značaju zelene ekonomije, povećanju konkurentnosti, unapređenju ukupne proizvodnje i, konačno, smanjenju siromaštva putem održivog privrednog rasta i razvoja. Ciljevi razvoja privrede Srbije mora da obuhvate intenzivnija strana ulaganja kroz strateška partnerstva u cilju održivog rasta, inovativne aktivnosti, unapređenjem organizacije rada i optimizacije procesa u cilju racionalnije potrošnje sirovina i materijala, energije i vode i smanjenja zagađenja vazduha, vode i zemljišta, i stvaranja bolje pozicije naših preduzeća kako na domaćem tako i na međunarodnom tržištu.

Ključne reči: Zelena ekonomija, strateška partnerstva, održivi razvoj.

GREEN ECONOMY AND STRATEGIC PARTNERSHIPS

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Global business is increasingly facing the companies with the need for strategic partnerships in every single area including the green economy. The advantages of creating strategic partnerships are mutual, as for the companies from highly developed countries which, by a rule, tend to improve their favourable market position by utilizing new opportunities in these markets (easier access to new and favourable purchasing and sales markets), and as well as those from less developed countries, as it is Serbia. Attracting and retaining foreign direct investments is the main goal of many countries, since it is quite clear that they have an important role in creating new jobs, increasing export, transferring of technology and business knowledge, and also raising awareness about the importance of preserving the green economy and increasing competitiveness, improving overall production and finally reducing poverty through general economic growth and development. Therefore, the objectives of development of the Serbian economy must include intensive foreign investment through strategic partnerships in order to sustain growth, better innovative activities, improving work organization and process optimization in order to more rational consumption of raw materials and other materials, energy and water, reducing the pollution of air, water and land, and creating a better position of our companies on both the domestic and the international market.

Keywords: green economy, strategic partnerships, sustainable development.

KRITERIJUMI ZA PROSTORNO PLANIRANJE PRIVREDNIH ZONA U SMERU RAZVOJA ZELENE EKONOMIJE U SLOVENIJI

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Promovisanje postojećih i planiranih privrednih zona u Republici Sloveniji predstavlja jednu od veoma aktualnih razvojnih tema sa kojom se, u novije vreme i u smeru razvoja zelene ekonomije, na stručnom, planskom i implementacijskom nivou bave različite državne i regionalne institucije kao i jedinice lokalne samouprave te preduzeća. U radu su naglašeni pretežno prostorni aspekti razvoja privrednih zona. Prikazana su usmerenja i kriterijumi njihovog razvoja koji su definisani u važećim prostornim dokumentima države kao i u rezultatima izabranih međunarodnih studija. U nastavku rada izneseni su predlozi kriterijuma za prostorno planiranje privrednih zona na državnom, regionalnom i subregionalnom nivou. Demonstrirani su primeri dugoročnog prostornog planiranja privrednih zona. U zaključku rada predstavljen je sadržaj web stranice INVEST SLOVENIA, koju je za potrebe agencije SPIRIT SLOVENIA koncipirao Urbanistički institut RS i u kojoj je predstavljena aktualna ponuda lokacija za razvoj privrednih zona u Republici Sloveniji.

Ključne reči: privredne zone, zelena ekonomija, promovisanje, planska usmerenja, prakse, Slovenija.

THE CRITERIA FOR SPATIAL PLANNING OF ECONOMIC ZONES TOWARDS THE DEVELOPMENT OF GREEN ECONOMY IN SLOVENIA

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Promoting the existing and planned business zones in the Republic of Slovenia has been one of the most important development issue, in the recent decade and towards the development of green economy, which has been dealt with at the expert, planning and implementation level by various national and regional institutions, local governments and enterprises. The paper highlights mainly the spatial aspects of the issue. Guidelines and criteria for business zones development as used in the valid spatial planning documents of the country and from selected international studies are presented. Examples of long-term spatial planning of economic zones in expert studies for regional spatial plans are highlighted too. A set of spatial planning criteria of economic zones at the national, regional and sub-regional level is furthermore explained. In the final part of the paper, the content of the website INVEST SLOVENIA, commissioned by the SPIRIT SLOVENIA - Public Agency for Entrepreneurship, Internationalization, Foreign Investments and Technology, and elaborated by the Urban Planning Institute of RS is presented. The website hosts an updated offer of the locations for the development of business zones in the Republic of Slovenia.

Keywords: business zones, green economy, promotion, planning guidance, practices, Slovenia.

NOVE TEHNOLOGIJE - IZAZOVI ZA KOMPANIJE I ODRŽIV EKONOMSKI RAZVOJ

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U doba elektronike i informatizacije, svet se uveliko menja, asavremene tehnologije i neophodnost postizanja održivog razvojau kome zadovoljavanje trenutnih potreba neće ugroziti zadovoljavanje potreba budućih generacija, postaju životna nužnost. Novi naraštaji rastu uporedo sa novim tehnologijama i njihovim neslućenim mogućnostima, a istovremeno raste i značaj definisanja održivih razvojnih ciljeva i konkurentskih strategija kompanija i nacionalnih ekonomija. Bez namere da se zapadne u tehnodeterminizam ili da se digitalizaciji ekonomije i novim tehnologijama pripiše prevelik značaj, u ovom radu se analizira njihov uticaj na kompanije i postizanje održivog razvoja, te pokušava da ukaže da su one danas osnova rasta i razvoja, kako pojedinačnih kompanija, tako i privreda u celini.Mogućnosti koje nude savremene tehnologije u postizanju bržeg, kvalitetnijeg, efikasnijeg, ekonomičnijeg i istovremeno održivog razvoja nisu dovoljno valorizovane u Republici Srbiji, a mnoge države sa sličnim ili čak slabijim privrednim potencijalima su poslednjih godina, zahvaljujuću primeni savremenih tehnoloških dostignuća, učinile napore koji su ih doveli na mapu značajnih svetskih ekonomija. Zbog toga se ovaj rad završava prezentovanjem preporuka, koje mogu biti značajne za primenu savremenih tehnologija za podsticanje održivog razvoja i na ovim prostorima i izvođenjem zaključaka.

Ključne reči: digitalizacija, održivi razvoj, investicije, uloga države.

NEW TECHNOLOGIES - CHALLENGES FOR COMPANIES AND SUSTAINABLE ECONOMIC DEVELOPMENT

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In the age of electronics and computerization, the world is changing and modern technologies and the need to achieve sustainable development where meeting the current needs will not endanger the needs of future generations, are becoming a necessity. New generations are growing along with new technologies and their unprecedented capabilities, and at the same time the importance of defining sustainable development goals and competitive strategies of companies and national economies is growing. Without intending to immerse themselves in techno-determinism or to attach too much importance to the digitalisation of the economy and new technologies, this paper analyzes their impact on companies and the achievement of sustainable development, and tries to indicate that they are today the basis of growth and development, as individual companies, so does the economy as a whole. Opportunities offered by modern technologies in achieving faster, better, more efficient, economical and at the same time sustainable development are not sufficiently valorized in the Republic of Serbia, and many countries with similar or even weaker economic potentials have made efforts in recent years thanks to the application of modern technological advances brought on the map of significant world economies. Therefore, this paper concludes with the presentation of recommendations, which can be significant for the application of modern technologies for stimulating sustainable development in these areas and drawing conclusions.

Keywords: digitalization, sustainable development, investments, role of the state.

DOPRINOS OBNOVLJIVIH IZVORA ENERGIJE RAZVOJU ZELENE EKONOMIJE I ODRŽIVE INDUSTRIJE

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Danas se veći deo svetske ekonomije bazira na upotrebi fosilnih goriva, među kojima najveći udeo imaju ugalj, nafta i zemni gas. Ekonomski razvoj i industrijska proizvodnja zasnovani na upotrebi neobnovljivih resursa imaju veoma negativne posledice po životnu sredinu. Među značajnije zagađivače spada energetski sektor i proizvodnja električne energije koja predstavlja pokretač savremene svetske industrije. S obzirom na velike ekološke probleme i posledice koje dosadašnji razvoj ima po životnu sredinu, nužan je transfer tradicionalne ekonomije u zelenu ekonomiju kao i transfer tradicionalne industrije u održivu industriju. Obnovljivi izvori energije imaju značajnu ulogu u tom procesu. U radu se ukazuje na značaj obnovljivih izvora energije za razvoj zelene ekonomije i održive industrije, sa aspektom na energetski sektor, na primeru zemalja Evropske Unije. Kao reprezentativni primer uzeta je Švedska. U radu se takođe ukazuje na osnovne karakteristike i potencijal obnovljivih izvora energije u Srbiji.

Ključne reči: Obnovljivi izvori energije, Zelena ekonomija, Održiva industrija

THE CONTRIBUTION OF RENEWABLE ENERGY SOURCES TO GREEN ECONOMY AND SUSTAINABLE INDUSTRY DEVELOPMENT

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The world economy is largely based on the use of fossil fuels, with coal, oil and natural gas accounting for the largest share. Economic development and industrial production based on the use of non-renewable resources have very negative environmental consequences. Significant pollutants include the energy sector and electricity generation, which is the driver of modern world industry. Given the major environmental problems and environmental consequences of the past, the transfer of the traditional economy to the green economy and the transfer of the traditional industry to a sustainable industry is necessary. Renewable energy can play an important role in this process. The paper points to the importance of renewable energy sources for the development of a green economy and a sustainable industry, with an aspect for the energy sector, on the example of European Union countries. Sweden was taken as a representative example. The paper also points to the basic characteristics and potential of renewable energy in Serbia.

Keywords: Renewable Energy, Green Economy, Sustainable Industry

CIRKULARNA EKONOMIJA U SKLADU S PRINCIPIMA ODRŽIVOG RAZVOJA

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Koncept cirkularne ekonomije (CE) u proizvodnji i potrošnji predstavlja obećavajuću alternativu za tradicionalni, linearni koncept ‘’uzmi, napravi, koristi i odbaci’’. U ovom radu se razmatraju posledice tranzicije prema CE na društvo i životnu sredinu, sagledavanjem takvog otklona unutar širih socio-tehničkih promena. Primena koncepta CE podrazumeva suštinske promene unutar ekonomskog podsistema. Cirkularna ekonomija, kao nova paradigma ekonomskog razvoja, nastoji da prevaziđe postojeće prakse u proizvodnji i potrošnji smanjenjem potrošnje resursa, ponovnim korišćenjem materijala i recikliranjem proizvoda i materijala u proizvodnji, distribuciji i potrošnji. Cirkularnost u velikoj meri doprinosi održivom razvoju i, prema tome, u odnosu je sa mnogim Cljevima održivog razvoja.
Prelaz prema CE, premda je neophodan u svetlu postojećih neodrživih tokova energije i materijala unutar globalnog ekonomskog sistema, predstavlja dugotrajan proces koji sputavaju brojne barijere. U ovom radu se diskutuju različiti pristupi, strategije i politike koje omogućavaju efektivnije upravljanje promenama prema CE. Na kraju, autori zaključuju da CE ima relevantnost ne samo za razvijene delove sveta već, možda i više, za zemlje u razvoju. Primena praksi CE u zemljama globalnog Juga, za razliku od razvijenih zemalja, uglavnom je neformalnog karaktera, podstaknuta siromaštvom i nezaposlenošću.

Ključne reči: Cirkularna ekonomija, održivi razvoj, tranzicija, barijere, zemlje u razvoju.

CIRCULAR ECONOMY IN ACCORDANCE WITH THE SUSTAINABLE DEVELOPMENT PRINCIPLES

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The concept of circular economy (CE) for human production and consumption is a promising alternative to the traditional, linear concept of ''take, make, use and dispose''. In this paper we consider the impacts of the transition to the CE on the society and environment after framing such shift within the social-technical changes. The application of the CE concept entails substantial changes within the economic subsystem. The CE, as a new paradigm of economic development, tend to overcome the current production and consumption practices by reducing, reusing and recycling materials and products in manufacturing, distribution and consumption. Consequently, circularity mainly contributes to the sustainable development, and, hence, it relates very well to many of the Sustainable Development Goals (SDG).
The transition to the CE, although it is strongly needed in terms of existing unsustainable flows of energy and materials within the global economic system, is a long-lasting process hampered by many obstacles. In the paper, we offer a discussion in regard to the various approaches, strategies and policy tools in order to more effectively manage the transition towards CE. At last, we conclude that CE has the relevance not only to the developed world but also, maybe even more, to the developing countries. The implementation of CE practices in countries of the Global South, unlike developed ones, is mainly undertaken informally, driven by poverty and unemployment.

Keywords: Circular economy, sustainable development, transitions, barriers, developing countries.

NOVE TEHNOLOGIJE I INOVACIJE - PUT DO CIRKULARNE EKONOMIJE

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Stalno preispitivanje i redizajniranje načna na kojima proizvodimo nove proizvode osnova je savremene ekonomije. Ciljevi održivog razvoja spojili su se u koncept cirkularne ekonomije - ekonomije koja od prirode uči tako da ništa ne troši. Eko-inovacija je ključna za postizanje mnogih aspekata kružne ekonomije: industrijske simbioze ili ekologije, dizajna od kolevke do kolevke i novih, inovativnih poslovnih modela. Model cirkulaerne ekonomije treba posmatrati kao inovaciju i kao strategiju ne samo za preduzeća, već i za društvo u celini. Pitanje je da li kreativnošću i inovacijama možemo primeniti model cirkularne ekonomije? Potpuno aktiviranje kružne ekonomije predstavlja radikalnu promenu i kao takva, posebno imajući u vidu trenutno funkcionisanje naših ekonomskih sistema, zahteva inovativne načine razmišljanja proizvodnih sistema i potrošnje. Realizacija cirkularne ekonomije sigurno se može olakšati inovacijama, posebno uvođenjem novih tehnologija i dizajnom inovativnih poslovnih modela. Digitalizacija će biti važan instrument za omogućavanje i olakšavanje kružne ekonomije.

Ključne reči: cirkularna ekonomija, redizajniranje, reciklaža, eko-inovacije.

NEW TECHNOLOGIES AND INNOVATIONS - THE WAY TO CIRCULAR ECONOMY

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The constant rethinking and redesigning of the ways we produce new products is the basis of modern economics. The sustainable development goals have merged into the concept of a circular economy-an economy that learns from nature so that it spends nothing. Eco-innovation is key to achieving many aspects of the circular economy: industrial symbiosis or ecology, cradle-to-cradle design and new, innovative business models. The circular economy model should be seen as an innovation and a strategy not only for businesses, but for society as a whole. The question is, can we apply the model of circular economy with creativity and innovation? The full activation of the circular economy is a radical change, and as such, especially given the current functioning of our economic systems, it requires innovative ways of thinking about production systems and consumption. The realization of the circular economy can certainly be facilitated by innovation, especially by the introduction of new technologies and the design of innovative business models. Digitization will be an important instrument for enabling and facilitating a circular economy.

Keywords: circular economy, redesign, recycling, eco-innovation.

KREIRANJE KONCEPTUALNOG MODELA CIRKULARNE EKONOMIJE ZA STVARANJE POSLOVA U REPUBLICI SRBIJI

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Tema cirkularne ekonomije je tokom poslednje decenije postala bitan fokus poslovnih strategija, politika vladinih institucija i akademskih istraživanja. Ipak, sam koncept je još uvijek nejasan i ne postoji konsenzus o njegovim definicijama i ciljevima. Prethodna istraživanja su prvenstveno bila usmerena na održivost, ekonomski rast i uticaj na okolinu. Jedno od važnih pitanja u prethodnim istraživanjima je bio uticaj na zapošljavanje, odnosno, kako cirkularna ekonomija može stvoriti nova radna mesta? Ovo pitanje je još važnije za privrede u razvoju kao što je ona u Republici Srbiji. U prvom delu ovog rada razmatra se postojeća literatura o pitanjima zapošljivosti u uslovima cirkularne ekonomije. U drugom delu predstavljeni su rezultati polustrukturisanih intervjua poslovnih lidera i naučnika iz oblasti cirkularne ekonomije. Na kraju rada, kreiran je konceptualni model za potencijalno stvaranje radnih mesta u Republici Srbiji kroz cirkularnu ekonomiju.

Ključne reči: cirkularna ekonomija, zapošljavanje, pregled literature, intervjui, modeli stvaranja radnih mesta.

ENGINEERING A CONCEPTUAL CIRCULAR ECONOMY MODEL FOR CREATING JOBS IN THE REPUBLIC OF SERBIA

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The topic on circular economy is, during the last decade, becoming a substantial focus of the business strategies, governmental institutions policies, and academic research. Nevertheless, the concept itself is still vague and there is not a consensus on its definitions and goals. The previous research has been primarily focused on sustainability, economic growth, and the impact on the environment. One of the important questions in the previous research has been the effect on the employment, mainly, how the circular economy can create new jobs? This issue is even more important for the emerging economies like the one of the Republic of Serbia. In the first part, this paper has been examining the existent literature on the employability issues of the circular economy. In the second part, the results of semi structured interviews of business leaders and the scholars in the field of circular economy have been presented. At the end of the paper, the potential conceptual model for creating jobs in the Republic of Serbia through circular economy has been engineered.

Keywords: Circular economy, employment, literature review, interviews, job creation models.

CIRKULARNA EKONOMIJA KAO OSNOVA ODRŽIVOG GLOBALNOG RAZVOJA

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Savremena društva se u svom ekonomskom razvoju na globalnom nivou suočavaju sa izazovima koji nemaju presedana u pređašnjim periodima. Ti izazovi uključuju devastaciju prirodnih resursa, nekontrolisano gomilanje odbačenih ostataka ovih resursa nakon njihovog neracionalnog iskorišćenja i vraćanja u sistem kao otpad (često vrlo toksičan). Neposredna posledica ovoga je narušavanje ravnoteže u ekosistemima i ugrožavanje životnog okruženja u najširem smislu. Cirkularna ekonomija predstavlja jedno od najznačajnijih teorijskih interdisciplinarnih koncepata oko kojeg se kao fokalne tačke grupiše niz teorijsko-metodoloških i praktičnih teorija, intelektualnih pokreta i praktičnih tehnika koje u poslednjih nekoliko decenija pokušavaju da pruže odgovore na ove izazove. U radu je ukazano na neke od ovih koncepata čiji su doprinosi u navedenom domenu privukli najveću pažnju naučne i stručne javnosti, počevši od koncepta “Od kolevke do kolevke“, Ekonomije performansi (takođe poznatu kao funkcionalne ekonomije usluga), Biomimikrije, Industrijske ekologije, Prirodnog kapitalizma, Plave ekonomije i Regenerativog dizajna.

Ključne reči: Održivi ekonomski razvoj, Zaštita životnog okruženja, Obnovljivi kružni tok materije i energije, Proizvodnja bez otpada.

CIRCULAR ECONOMY AS THE BASIS OF SUSTAINABLE GLOBAL DEVELOPMENT

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Contemporary societies today are facing challenges in their economic development globally that are unprecedented in previous periods. These challenges include the devastation of natural resources, the uncontrolled accumulation of discarded remains of these resources after their irrational exploitation, and the return to the system as (often very toxic) waste; the immediate consequence of this is to disturb the balance of ecosystems and endanger the environment in the broadest sense. Circular Economy is one of the most significant theoretical interdisciplinary concepts around which as a focal point is grouped a number of theoretical-methodological and practical theories, intellectual movements and practical techniques that have been trying to answer these challenges in recent decades. The paper highlights some of these concepts whose contributions in the said domain have attracted the greatest attention of the scientific and professional public, beginning with the concept of Cradle to Cradle, Performance Economics (also known as functional service economics), Biomimicry, Industrial Ecology, Natural Capitalism, Blue Economy and Regenerative Design.

Keywords: Sustainable economic development; Environmental protection, Renewable flow of matter and energy, Production without waste.

CIRKULARNA EKONOMIJA I OČUVANJE EKORESURSA

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Cirkularna ekonomija, kroz razvoj lokalnih ekonomija doprinosi poboljšanju efikasnosti korišćenja resursa, smanjenju otpada, štednji energije, zaštiti životne sredine, razvoju ostalih modela zelene ekonomije, ali i otvaranju novih radnih mesta. Upravljanje otpadom na bazi cirkularne ekonomije, značajno doprinosi poboljšanju efikasnosti korišćenja resursa. Primenom koncepta cirkularne ekonomije utiče se na obnovljivost materijala, smanjenje stvaranja otpada kroz ponovnu upotrebu sa ciljem stvaranja ekonomske koristi, ali i očuvanja životne sredine.
Neracionalna upotreba resursa, dovodi u pitanje koncept održivog razvoja, s obzirom da izaziva klimatske promene, ugrožava zdravlje ljudi i uzrokuje drastične razlike u stepenu razvoja, a socioekonomski razvoj je u direktnoj vezi sa ljudskom bezbednošću i porastom kvaliteta života. Ravnoteža ekonomskih i društvenih uticaja, kao i uticaja na životnu sredinu, mora postati glavni zadatak (racionalna upotreba prirodnih resursa i strategija razvoja). Ekonomski razvoj mora ići paralelno uz minimalne štete po životnu sredinu, ali i pokušaj da se reše ili bitno smanje štetni efekti do sada.
Četvrta industrijska revolucija može biti od značaja za razvoj zelene ekonomije i zaštitu životne sredine, jer nju pokreću nanotehnologije, neurotehnologije, veštačka inteligencija i ostale napredne tehnologije. Nove tehnologije, organizacije proizvodnje, tržišta i ekonomije otvaraju novu etapu opšteg društvenog razvoja, ali svakako drugačiju – eru ekoloških pitanja i problema. Delatnosti i institucije koje će ovu problematiku razvijati moraju pristupiti svemu na način da korist od četvrte industrijske revolucije bude što univerzalnija, posebno ona koja se tiče ekološkog informisanja i ekološkog obrazovanja.

Ključne reči: cirkularna ekonomija, četvrta industrijska revolucija, socijalno preduzetništvo, upravljanje otpadom, životna sredina.

CIRCULAR ECONOMY AND PRESERVATION OF ECOLOGICAL RESOURCES

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The circular economy, through the development of local economies, contributes to improving resource efficiency, reducing waste, saving energy, protecting the environment, developing other models of the green economy, but also creating new jobs. The circular economy-based waste management contributes significantly to improving resource efficiency. The application of the concept of circular economy has an impact on the renewability of materials, the reduction of waste generation through reuse with the aim of generating economic benefits but also preserving the environment.
The irrational use of resources calls into question the concept of sustainable development, since it causes climate change, threatens human health and causes drastic differences in the degree of socio-economic development, which is directly related to human security and the increase in the quality of life. Achieving the balance of economic and social impacts, as well as environmental impacts, must become a major task (rational use of natural resources and development strategies). Economic development must go hand in hand with minimal environmental damage, but also an attempt must be made to address or substantially reduce the adverse effects so far.
The fourth industrial revolution can be important for the development of the green economy and the environment, as it is powered by nanotechnology, neurotechnology, artificial intelligence and other advanced technologies. New technologies, production organizations, markets and economies are opening up a new stage of general social development, but certainly a different one - an era of environmental issues and problems. The activities and institutions that will be addressing these issues must approach everything in such a way that the benefits of the fourth industrial revolution are as universal as possible, especially those related to environmental information and environmental education.

Keywords: circular economy, fourth industrial revolution, social entrepreneurship, waste management, environment.

AFIRMACIJA MODELA CIRKULARNE EKONOMIJE U MALIM I SREDNJIM PREDUZEĆIMA

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Cirkularna ekonomija predstavlja platformu četvrte industrijske revolucije za ostvarenje održivog razvoja privrede i preduzeća. To je model ekonomije koji menja dosadašnju paradigmu, a podrazumeva upravljanje resursima na planski, racionalan i efikasan način. Koncept cirkularne ekonomije svoje temelje ima u eko-inovacijama, eko-dizajnu, naprednoj tehnologiji, energetskoj efikasnosti i korišćenju obnovljivih izvora energije. On prepoznaje važnost ekonomije koja mora efikasno raditi na svim nivoima - za velika i mala preduzeća, za organizacije i pojedince, globalno i lokalno. Cirkularna ekonomija favorizuje aktivnosti koje čuvaju vrednost u obliku energije, rada i materijala. To znači dizajniranje za trajnost, ponovnu upotrebu, preradu i recikliranje kako bi proizvodi, komponente i materijali cirkulisali ekonomijom. Cilj ovog rada je povećati znanje o preprekama i podsticajima sa kojima se susreću mala i srednja preduzeća prilikom primene poslovnih modela cirkularne ekonomije. Autori preporučuju jačanje politike ozelenjivanja potrošačkih preferencija, razvoj organizacione kulture i podržavanje i prepoznavanje zelenih poslovnih modela malih i srednjih preduzeća, to je prikazano kroz dobru poslovnu praksu cirkularne ekonomije u mlekari „Lazar“ iz Blaca.

Ključne reči: cirkularna eknomija, inovacije, zelena ekonomija, energetska efikasnost.

AFIRMATION OF THE CIRCULAR ECONOMY MODEL IN SMALL AND MEDIUM-SIZED ENTERPRISES

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Circular economy is the platform of the fourth industrial revolution for achieving sustainable development of economy and business. It is an economy model that changes the paradigm so far, and involves managing resources in a planned, rational and efficient manner. The concept of circular economy has its foundation in eco-innovation, eco-design, advanced technology, energy efficiency and the use of renewable energy. He recognizes the importance of an economy that must work effectively at all levels - for large and small businesses, for organizations and individuals, globally and locally. The circular economy favors activities that preserve value in the form of energy, labor and materials. This means designing for durability, reuse, recycling and recycling to circulate products, components and materials to the economy. The aim of this paper is to increase knowledge of the obstacles and incentives that SMEs face when applying the business models of the circular economy. The authors recommend strengthening the policy of greening consumer preferences, developing organizational culture and supporting and recognizing green business models of small and medium enterprises, this is shown through the good business practice of the circular economy in the dairy "Lazar" from Blace.

Keywords: circular economy, innovation, green economy, energy efficiency.

INOVACIJE I DIGITALIZACIJA EKONOMIJE

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Inovacije imaju sve veći primat u savremenom poslovanju, do mere u kojoj iste postaju sve više nezamenjive kada se radi o digitalnim tehnologijama. Dolazi do sve bržeg porasta broja korisnika digitalnih tehnologija, koja ide uporedo sa njenom sve većom dostupnošću, tako da je činjenica da dolazi do mnogih novih tendencija koje u sve većoj meri utiču na korišćenje i upotrebu novca prilikom transakcija različite vrste. Pre svega, najveći uticaj i promena, odnosno evolucija IT sektora može se uvideti kada se radi o internetu, kao nezamenjivom sredstvu komunikacije u savremenom svetu. Dolazi do široke upotrebe digitalnih elektronskih kompjutera, kao i ličnih kompjutera. Takođe sa druge strane, poslednjih nekoliko godina dolazi u još većem obimu do korišćenja ostalih uređaja neophodnih kao sredstvo komuniciranja u digitalnoj tehnologiji. Pre svega to možemo videti u činjenici da je došlo do naglog povećanja korisnika interneta, koji internet koriste ne preko elektronskih kompjutera, niti ličnih kompjutera, već preko tableta i mobilnih telefona, androida, smartfona, itd. Sve ove činjenice utiču na novac kao sredstvo plaćanja između različitih subjekata koji su u dužničko - poverilačkim odnosima. Naime, kroz savremene aplikacije i multifunkcionalnost različitih vrsta uređaja utiče se na ovaj trend. Svakako da ovakve promene za sobom povlače veoma velik uticaj na svakodnevni život korisnika digitalnih tehnologija. Korisnicima se pruža sve šira ponuda sve raznovrsnijih uređaja kojima će biti omogućena različiti načini bezgotovinskog plaćanja. Predviđanja su da će se taj trend dalje ubrzavati.

Ključne reči: inovacije, multifunkcionalnost, digitalna tehnologija, savremeno poslovanje, transakcije

INNOVATIONS AND DIGITALIZATION OF THE ECONOMY

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Innovation is gaining ground in modern business, to the extent that it is becoming increasingly irreplaceable when it comes to digital technologies. There is an increasing number of digital technology users, which goes hand in hand with its increasing availability, so the fact is that there are many new trends that are increasingly affecting the use and use of money in transactions of a different kind.
First of all, the biggest impact and change, that is, the evolution of the IT sector, can be seen when it comes to the Internet, as an indispensable means of communication in the modern world. There is a widespread use of digital electronic computers as well as personal computers. On the other hand, in the last few years, the use of other devices needed as a means of communication in digital technology has been increasing. First of all, we can see in the fact that there has been a rapid increase in internet users, who use the internet not via electronic computers, nor personal computers, but via tablets and mobile phones, androids, smartphones, etc. All of these facts affect money as a means of payment between various entities that are in debt - trust relationships. Specifically, it is through modern applications and the multifunctionality of different types of devices that this trend is influenced. Certainly, such changes bring with them a great impact on the daily lives of digital users. Customers are offered an ever-expanding range of devices that will allow for different forms of cashless payment. The trend is predicted to accelerate further.

Keywords: innovation, multifunctionality, digital technology, modern business, transactions.

ZELENI MARKETING I ZELENA EKONOMIJA U FUNKCIJI ZAŠTITE VODNIH RESURSA SRBIJE

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Svaka epoha u razvoju ljudskog društva, pa i ova, donosi i prednosti i nedostatke, ali cilj je uvek isti: stvoriti ekonomiju i novu industrijsku strukturu zasnovanu na strategiji održivog razvoja. Trošenje ogromnih količina energije, veliko i nekontrlisano zagađenje zemlje, vode, vazduha, kao i nekontrlisano korišćenje prirodnih resursa, vode nas do velikih problema u zelenoj ekonomiji. Srbija poseduje značajan potencijal u vodnim resursima i to doprinosi vidnom ekonomskom razvitku zemlje. Ipak, jedan od najimpresivnijih oblika ugrožavanja prirode je zagađivanje vode. Neophodno je promišljeno i mudro poslovanje, koje pre svega podrazumeva smanjeno i racionalno trošenje resursa i stvaranje ekološki vrednijeg privrednog ambijenta. Dobrim upravljanjem i korišćenjem resursa i očuvanjem prirodnog bogatstva promovišemo ciljeve održivog razvoja i zdravog života. Porast populacije na planeti, uslovljava i veće korišćenje svih resursa. Ekološki marketing kao prvo, mora povratiti ravnotežu i poverenje između legitimne marketing aktivnosti i potrošača, a zatim započeti sa pronalaženjem održivih, ekološki prihvatljivih oblika delovanja u javnom prostoru. Za održivi marketing potrebni su menadžeri sa znanjem i posvećenošću održivom razvoju, a ključni faktor za njih je obrazovanje.

Ključne reči: Zeleni marketing, zelena ekonomija, vodni resursi.

GREEN MARKETING AND GREEN ECONOMY IN THE FUNCTION OF WATER RESOURCES PROTECTION IN SERBIA

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Every epoch in the development of human society, including this one, has both advantages and disadvantages, but the goal is always the same: to create an economy and a new industrial structure based on a sustainable development strategy. Spending huge amounts of energy, great of the uncontrolled pollution of earth, water, air, and uncontrolled use of natural resources, lead us to big problems in the green economy. Serbia possesses significant potential in water resources which contributes to the visible economic development of the country. It is necessary for prudently and wisely business operations, which primarily means reduced and rational use of resources and the creation of environmentally worthier economic environment. Good governance and resource use and conservation of natural wealth we are promoting the objectives of sustainable development and healthy living. The increase in population on the planet, conditions and greater use of all resources. First of all, environmental marketing must restore the balance and the trust between a legitimate marketing activity and the consumer, and then it should start with finding sustainable environmentally-friendly forms of action in the public space The most needed for achieving a sustainable marketing are the managers with knowledge and a commitment to sustainable development, and a key factor for them is the education.

Keywords: Green marketing, green economy, water resources, protection of water quality

PRIMENA KOMPOSTIRANJA U CILJU RAZVOJA ZELENE EKONOMIJE U SRBIJI

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Čovek je jedino biće na planeti koje stvara otpad. Zbog sve većih količina i štetnosti po okolinu, otpad se smatra jednim od najozbiljnijih ekoloških problema savremenog sveta. Čovek je svojim aktivnostima odlučujući činilac u promeni životne sredine. Sve te aktivnosti su povezane sa zadovoljavanjem životnih potreba. Veliki deo potreba je stvoren veštački i pitanje je da li nam je potreban toliki broj različitih proizvoda, koji će nakon upotrebe postati otpad. Naša civilizacija proizvodi sve više otpada i ništa ne ukazuje na skore promene ovog trenda. Ipak, zahvaljujući tehnološkom napretku i razvoju ekološke svesti, borba protiv otpada postaje mnogo uspešnija. Nastajanje otpada je rezultat ukupne ekonomske aktivnosti svake države, i kao takvo u direktnoj korelaciji je sa nacionalnom ekonomijom. Zato je neophodno preći sa klasične na zelenu ekonomiju. Prelazak na zelenu ekonomiju podrazumeva uvođenje eko-standarda u svim sektorima privredne i ekonomske delatnosti, infrastrukturi, energetici, saobraćaju, poljoprivredi, turizmu i upravljanju otpadom, kao nusproduktom svake ljudske delatnosti. Što bi imalo za cilj stvaranje što većeg broja zelenih radnih mesta koja bi dovela do smanjenja siromaštva i očuvanja životne sredine. Postavlja se pitanje u kom sektoru najpre treba primeniti principe zelene ekonomije? Imajući u vidu količinu, obim i raznovrsnost otpada koji nastaje na dnevnom nivou u Srbiji, slobodno bi mogli reći da je to sektor upravljanja otpadom. Zato autor ukazuje na značaj kompostiranje kao vida tretmana otpada u cilju razvoja zelene ekonomije u Srbiji. Ukazuje na specifičnosti metode kompostiranja, koja je nedovoljno razvijena u Srbiji, a u direktnoj je vezi sa principima zelene ekonomije.

Ključne reči: otpad, ekonomija, zelena ekonomija, upravljanje otpadom, kompostiranje.

USING COMPOSTING TO DEVELOP GREEN ECONOMY IN SERBIA

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Humans are the only beings on Earth that generate waste. Due to its increasing amounts and its harmful impact on the environment, waste is considered one of the most serious environmental issues of the modern world. Human activities are a key factor for environmental change, as they all concern providing the basic needs. Many of the needs have been artificially introduced and it is disputable whether people need so many different products, which will inevitably become waste after use. Our civilization generates increasing amounts of waste and there is nothing to indicate that this trend will change any time soon. However, owing to the technological development and raised ecological awareness, the fight against waste is becoming more successful. Waste generation is the result of overall economic activity of every country and thus directly correlates with national economy. Hence, it is necessary to transition from traditional to green economy. Transition to green economy requires the introduction of eco-standards in all sectors of the economy, infrastructure, energy industry, transport, agriculture, tourism, and waste management, since waste is a by-product of every human activity. This, in turn, should help create more green jobs, thus reducing poverty and preserving the environment. The question is in which economic sector the green economy principles should be implemented first. Considering the amount, scope, and diversity of waste generated daily in Serbia, the response should be – in waste management. Therefore, this paper highlights the importance of composting as a method of waste treatment aimed at developing green economy in Serbia. The paper also discusses the particularities of composting, which is underdeveloped in Serbia, even though it is directly associated with the principles of green economy.

Keywords: waste, economy, green economy, waste management, composting.

DIGITALIZACIJA EKONOMIJE - UTICAJ NA TRŽIŠTE RADA I ZAPOSLENOST

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Digitalizacija je danas jedna od osnovnih pretpostavki rasta i razvoja, kako pojedinačnih kompanija, tako i privrede u celini. Cilj ovog rada je da ukaže na uticaj digitalizacije ekonomije na tržište rada, odnosno ponudu i tražnju na tržištu radne snage, i pokuša da odgovori da li ovaj proces pozitivno ili negativno utiče na zaposlenost. Digitalizacija ekonomije iziskuje konstantno unapređivanje znanja i podizanje digitalne pismenosti. Ovo nameće i pitanja: Da li su svi ljudski resursi u mogućnosti da prate nove trendove? Da li će se neka radna mesta ugasiti i ostaviti ljude bez posla i osnovne egzistencije? Da li će automatizacija poslovanja, pojednostavljenje rada uz upotrebu tehnike dovesti do toga da ljudi budu „žive mašine“?, na koja ovaj rad pokušava da odgovori. Značaj ove teme, proizilazi i iz činjenice da oko 1/4 nacionalnog dohotka svake ekonomije odlazi zaposlenima u obliku zarada, te da se glavni deo nacionalnog dohotka ne dobija kao primanje vlasnika kapitala (profit, renta, kamata), već u obliku zarada. Iz ovoga je jasno da je rad, kvantitativno, najvažniji ekonomski resurs, a digitalizacija ekonomije može pozitivno, ali i negativno da utiče na njegovu upotrebu.

Ključne reči: četvrta industrijska revolucija, informacione tehnologije, funkcionalna znanja.

DIGITALIZATION OF THE ECONOMY - IMPACT ON THE LABOR MARKET AND EMPLOYMENT

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Today, digitalization is one of the basic preconditions for growth and development, both of individual companies and the economy as a whole. The aim of this paper is to point out the impact of digitalization of the economy on the labor market, ie supply and demand in the labor market, and try to answer whether this process has a positive or negative impact on employment. The digitalization of the economy requires constant improvement of knowledge and raising digital literacy. This also raises questions: Are all human resources able to keep up with new trends? Will some jobs be cut and people left without jobs and basic livelihoods? Will business automation, simplification of work with the use of technology lead to people being "living machines"?, to which this work tries to respond. The importance of this topic stems from the fact that about 1/4 of the national income of each economy goes to employees in the form of wages, and that the main part of the national income is not received as capital owners (profit, rent, interest), but in the form of wages. From this it is clear that labor is, quantitatively, the most important economic resource, and the digitalization of the economy can positively but also negatively affect its use.

Keywords: fourth industrial revolution, information technology, functional knowledge.

ХИДРО СИСТЕМ ИБАР-ЛЕПЕНАЦ, ОСНОВА РАЗВОЈА ЦИРКУЛАРНЕ ЕКОНОМИЈЕ НА КОСОВУ И МЕТОХИЈИ

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Интензивни привредни развој земаља света, као и нарастање светске популације је као непосредну реперкусију имамо и деградацију земљишних површина као и превођење обрадивог земљишта у грађевинско. Недовољно контролисана сеча шума је такође процесом ерозије довела до интензивнијег смањења земљишних површина које су погодне за узгој пољопривредних култура. Наведени процеси уз интензивни раст светске популације становништва су довели и до „прехрамбене баријере“ која преставља детерминанту даљег раста и развоја. Иако су се у времену треће технолошке револуције, продорима у сфери биотехнологије и генетског инжињеринга проширила подручија за узгој пољопривредних кулура зато што су створени нови облици живота отпорнији на оштрије климатске услове, даљи одрживи развој светске популације захтева интензивније бављење пољопривредном прозиводњом применом мера мелиорације и механизације јер су процеси хемизације у директној супротности са захтевима за еколошки исправном био храном. Због тога се процесима изградње мелиорационих ситема у будућности треба поклонити више пажње. Овај процес је потенциран чињеницом да се савремени свет суочава са процесом отоплъавања планете земље те су стога и потребе за слатком водом неопходном за развој пољопривредне производње све интензивније.

Иако су технолошки продори у време треће и четврте технолошке револуције делом релативизовале идеје демографа Роберта Малтуса исказане у његовој Теорији о становништву, настале пре готово два века, неомалтузијанци су прихватили његовеидеје и исте радикализовали сматрајући да је императив сваког друштва да делује ограничавајуће на сопствени раст у условима недостатка средстава за његов опстанак.

Кључне речи: Одрживи раст, циркуларна економија, демографска експанзија

IBAR-LEPENAC HYDRO SYSTEM, THE BASIS FOR THE DEVELOPMENT OF THE CIRCULAR ECONOMY IN KOSOVO AND METOHIJA

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Intensive economic development followed by world's population growth causing degradation of large land areas and conversion of arable land into construction land, around the Globe. Insufficiently controlled forest cut and deforestation also cause land erosion and intensive reduction of land areas suitable for cultivating crops. These processes, along with the intensive growth of the world's population, have also led to making a "food barrier", which is a determinant to further growth and development. Although during the third technological revolution, due to advances in biotechnology and genetic engineering, areas for cultivating crops have been expanded because of new crop species created resistant to more extreme climate conditions. Further sustainable development of the world's population also requires more intensive agricultural production through land reclamation and engaging mechanization. On the other side, chemical processes in the land are in direct conflict with ecologically safe, bio-food. For that reason, more attention should be paid to the processes of building reclamation systems in the future. This process is highlighted by the fact that the modern world is facing the process of warming of the planet and increasing needs for fresh water necessary for the development in agriculture production.

Although technological breakthroughs during the third and fourth technological revolutions partially relativized the ideas of demographer Robert Malthus expressed in his Theory of Population, which originated some two centuries ago. Neo-Malthusians accepted his ideas and radicalized them, believing that restriction of own growth in conditions of missing sources for the survival is imperative for every human society.

Keywords: sustainable growth, circular economy, demographic expansion.

РЕСУРСНА ЕФИКАСНОСТ ЕНЕРГЕТСКИХ ПРОЈЕКАТА НА ПРОСТОРУ КОСОВА И МЕТОХИЈЕ

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Ресурсно ефикасна Европа, је један од императивних захтева у нормативним регулативама ЕУ. У складу с тим ЕУ захтева и од оних земаља које нису чланице, а у процесу су приклључења, да своје економске системе граде на исти начин усклађујући своју законодавну регулативу са ЕУ. Интенција ове политике се огледа у тежњи да се у будућем периоду обезбеди привредни раст уз мање негативне екстерне ефекте на животну средину. Полази се од тога да се обезбеди одрживо управљање свим ресурсима променама у производњи али и у свери потрошње, са тежњом да се негативне екстерналије интернализују. У том контексту се преиспитују одређена пројектна усмерења у енергенитици Косова и Метохије која су дивергентна у односу на прокламоване циљеве, те из тог разлога воде ка даљем девастирању животне средине повећањем емисије штетних гасова, појачавањем ефекта стаклене баште којима се нарушавају кључни приоритети ЕУ на којима је заснована и њена стратегија развоја.
Уместо усмерења ка обновљивим изворима енергије, на Косову и Метохије се и у савременим условима форсира изградња ресурсно неефикацних енергетских капацитета иако постоје реалне могућности па чак и компаративне предности у прозводњи електричне енергије из обновљивих извора енергије, а нарочито коришћењем соларне енергије.
Аналзирајући структуру извора, највећи удео у производњи електо енергије на Косову и Метохији имају термоелектране, те би због тога у наредном периоду примат требало дати обновљивим изворима енергије чиме би се уравнотежио енергетских биланс, али нам анализа актуелних пројеката указује на чињеницу да се и даље форсира производња на основу лигнита као фосилног необновљивог извора, без обзира на негативне екстерналије.

Кључне речи: Енергетика, екстерни ефекти, животна средина, обновљиви извори енергије.

RESOURCE EFFICIENCY OF ENERGY PROJECTS IN KOSOVO AND METOHIJA

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Resource-efficient Europe is one of the imperative requirements in EU regulations. Consequently, the EU requires non-members and those in the process of joining EU, to build their economic systems in same manner and harmonize their legislation with the EU, as well. The intention of this policy is reflected in the aspiration to ensure economic growth in the future with less negative external effects to the environment. The starting point is to ensure sustainable management of all natural resources by changes in production, but also in the sphere of consumption, with the aim of internalizing negative externalities. In that context, certain project orientations in the energy sector of Kosovo and Metohija divergent to the proclaimed goals have been reconsidered since these projects lead to further environmental damages by increasing emissions of harmful gases and greenhouse effects that threaten key EU priorities, fundamental for its development strategy.
Instead of focusing on renewable energy sources construction of resource-inefficient energy capacities is being forced in Kosovo and Metohija recently, even there are real possibilities and comparative advantages in the production of electricity from renewable energy sources, especially by using solar energy.
In the analysis of the structure of sources, the largest share in the production of electricity in Kosovo and Metohija belong to thermal power plants. For that reason, priority should be given to renewable energy sources in the coming period which would stabilize energy balance. However, the analysis of current projects indicates that lignite-based production of electricity, from fossil non-renewable source is continuing, regardless of negative externalities.

Keywords: energy, externalities, environment, renewable energy sources.

Sekcija 2

RAZVOJ PAMETNIH GRADOVA I PRIMENA NOVIH TEHNOLOGIJA

Section 2

DEVELOPMENT OF SMART CITIES AND APPLICATION OF NEW TECHNOLOGIES

УЛОГА ИНОВАЦИЈА У ЧЕТВРТОЈ ИНДУСТРИЈСКОЈ РЕВОЛУЦИЈИ

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Историја човечанства је историја људске маште, њених примена и креативности. Од прве тачке, клинастог писма, парне машине, пеницилина, чипа и многих других открића и иновација - машта стваралаца допринела је достизању данашњег нивоа напретка. Четвртој индустријској револуцији претходиле су економске револуције које су довеле до друштвених промена. Прва индустријска револуција почела је са механизованом производњом оствареном помоћу водене паре, друга индустријска револуција остварила је масовну производњу помоћу електричне енергије, а трећа је аутоматизовала производњу уз помоћ електронике и информационих технологија. Све индустријске револуције су се заправо појавиле као продукт трагања капитала за ефикаснијом економијом и повећањем прихода. Иновације које су човеку увек отварале пут биле су основа за то. Четврта индустријска револуција у суштини се не разликује од претходних. Страхови и забринутости које она изазива готово су идентични претходним. Циљ овог рада је да се проучи утицај иновација на токове четврте индустријске револуције.

Кључне речи: четврта индустријска револуција, дигитална економија, иновативност, апликативност, социјални проблеми, правни проблеми.

THE ROLE OF INNOVATIONS IN THE FOURTH INDUSTRIAL REVOLUTION

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The history of mankind is the history of human imagination, its applications and creativity. From the first point, the wedge letter, the steam machine, the penicillin, the chip, and many other discoveries and innovations - the imagination of creators has contributed to reaching today's level of progress. The fourth industrial revolution was preceded by economic revolutions that created social change. The first mechanized production with water vapor, the second with the help of electricity generated mass production, and the third automated the production with the help of electricians and information technologies. All industrial revolutions have actually emerged as a product of demand for capital for a more efficient economy and an increase in revenue. The innovations that always paved the way for humanity were always the basis for this. The fourth industrial revolution does not differ from the previous one. The fears and misgivings that she provokes are almost identical to the previous ones. The objective of this paper is to introduce and familiarize readers with the principles of industrial revolutions, the impact of innovations on them and legal problems.

Keywords: innovation, the fourth industrial revolution, “new economy”, legal problems.

PAMETNI GRADOVI KAO POJAVNI OBLIK ČETVRTE INDUSTRIJSKE REVOLUCIJE

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Pametan grad je više od modernog izraza u savremenomgovoru. Nov je pristup samom poimanju grada i pametnog korišćenja njegovih delova, podataka koje svaki grad pruža svakog momena i korišćenje tih podataka u svrhu kvalitetnijeg života. Današnji gradovi nisu kreirani za tako velik broj stanovnika koji u njima živi, kao ni za konstantan prilliv novih stanovnika iz ruralnih područja. U radu je navedeno da su procene da će u gradovima do 2050. godine živeti blizu 70% odnosno oko 2/3 stanovništva. Pametni gradovi su jedan od načina da se organizuje život u tako gusto naseljenim gradovima.

Iz tog razloga je potrebna dobra volja i saradnja građana sa gradskom administracijom. Ova dobra volja nije dovoljna za kreiranje i funkcionisanje pametnog grada. Naime, uslov bez koga se ne može zamisliti pametan grad je razvijena i primenjena informaciona i informatička osnova. Infrastruktura grada se postavlja na osnovu merenja i analize ove dve vrste podataka. Sve navedeno mora biti praćeno razvijenom tehnologijom koje podržavaju aplikacije u čijoj upotrebi učestvuju i građani.

Prema svojim karakteristikama pametan grad je deo 4.0 revolucije. Prelazak u narednu revoluciju karakteriše tehnički napredak ravan kvantnom skoku. Razvoj informatičke i sajber oblasti je doveo celo društvo do četvrte industrijske revolucije koju već delimično živimo. Kompletna automatizacija procesa proizvodnje ili robotizacija, vodi ka sve manjoj ulozi i nezavisnosti proizvodnje od čoveka. Ovo svakako zvuči malo obeshrabrujuće. Realizuju se procesi kao što su korišćenje klauda (“oblaka u oblasti informatike” kao načina čuvanja i preuzimanja informacija), “internet stvari (“internet of things”- ioT), gde se pametne fabrike zasnivaju na samostalnim pametnim mrežama koje su samokontrolišuće.

U radu je posmatran uzorak od 102 grada, različita po geografskom rasporedu, broju stanovnika i drugo a merena je realna primena raznih informacionih tehnologija radi realizacije pametnog grada. Zaključak je da otvorene baze podataka i ovakvi gradovi menjaju stanovnike u ljude spremnije za nastavak informatičkog obrazovanja. Ovo istraživanje je pokazalo da su najveći uspeh u ovoj obasti učinili evropski gradovi.

Ključne reči: 4.0 revolucija, pametan grad, robotizacija, informatičke i informacione tehnologije

SMART CITIES AS A PHENOMENON OF THE FOURTH INDUSTRIAL REVOLUTION

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A smart city is more than a modern expression in modern speech. It is a new approach to the understanding of the city and the smart use of its parts, the data that every city provides at every moment and the use of that data for the purpose of a better quality of life. Today's cities are not created for such a large number of inhabitants who live in them, nor for the constant migrations of new inhabitants from rural areas. The paper states that it is estimated that close to 70% or about 2/3 of the population will live in cities by 2050. Smart cities are one way to organize life in such densely populated cities.

For that reason, good will and cooperation of citizens with the city administration is needed. This good will is not enough to create and function a smart city. Namely, the condition without which a smart city cannot be imagined is the developed and applied information and information base. The city's infrastructure is set up based on measurements and analysis of these two types of data. All of the above must be accompanied by developed technology that supports applications in the use of which citizens also participate.

According to its characteristics, the smart city is part of the 4.0 revolution. The transition to the next revolution is characterized by technical progress equal to the quantum leap. The development of the information and cyber field brought the whole society to the fourth industrial revolution, which we are already partially living. Complete automation of the production process, or robotization, leads to a diminishing role and independence of production from man. This certainly sounds a little discouraging. Processes such as the use of the cloud ("cloud in the field of informatics" as a way of storing and retrieving information), "internet of things" (ioT), where smart factories are based on independent smart grids that are self-controlling.

The paper observes a sample of 102 cities, different in geographical distribution, number of inhabitants, etc., and measured the real application of various information technologies for the realization of a smart city. The conclusion is that open databases and such cities are changing residents into people more willing to continue IT education. This research has shown that the greatest success in this area has been made by European cities.

Keywords: 4.0 revolution, smart city, robotics, information and information technologies

IAHP KAO PODRŠKA PRIMENI TEHNOLOŠKIH INOVACIJA U RAZVOJU PAMETNIH GRADOVA

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Pametni gradovi poslednjih godina postepeno prelaze iz idealizovane želje u okvire realnih mogućnosti budućeg razvoja urbanih područja, a sve zahvaljujući razvoju inovativnih informaciiono-komunikacionih tehnologija. Korišćenje savremenih tehnologija kao što su bežične mreže i mnoge aplikacije promenile su način života u urbanim sredinama i upravo takve tehnologije čine da pametni gradovi postanu realnost. Osim što se integriše u sve elemente i servise urbane sredine, IKT sektor istovremeno povezuje sve činioce procesa razvoja pametnog grada, aktere, akcije, i faze, koordinira komponentama grada i sprovođenju akcionih mera. Zbog toga su nove tehnologije neizostavna pomoć u menadžmentu pametnih gradova. U procesu razvoja pametnog grada nije moguće odjednom isplanirati, osmisliti i imlementirati sve elemente koji imaju za cilj poboljšavanje kvaliteta života ljudi u gradu i odgovoriti na sve zastupljenije izazove globalizacije, urbanizacije i globalnog zagrevanja. Postavlja se pitanje pronalaženja adekvatne metodologije koja bi, uzimajući u obzir karakter predmetne sredine, ukazala na one segmente jednog grada kod kojih prvo treba intervenisati u pogledu implementiranja pametnih tehnologija. Tehnološke inovacije mogu unaprediti svakodnevni život stanovnika ukoliko se izabere da tehnologija bude maksimalno prilagođena korisnicima. Rad daje predlog primene višekriterijumske analize i IAHP metode u rešavanju ovih problema, rangirajući indikatore koji se odnose na primenu tehnoloških inovacija pametnog razvoja grada.

Ključne reči: pametan grad; intervalni AHP; indikatori; okruženje tehnološke inovacije

IAHP AS SUPPORT THE IMPLEMENTATION OF TECHNOLOGICAL INNOVATION IN SMART CITY DEVELOPMENT

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In recent years, smart cities have been gradually moving from an idealized desire to the real possibilities of future urban development, all thanks to the development of innovative information and communication technologies. The use of modern technologies such as wireless networks and many applications have changed the lifestyle in urban environments, and it is precisely such technologies that make smart cities a reality. In addition to integrating into all elements and services of the urban environment, the ICT sector simultaneously connects all actors of the smart city development process, actors, actions, and stages coordinate the components of the city and implementation of active measures. Therefore, new technologies are indispensable help in managing smart cities. In the process of developing a smart city, it is not possible to plan, design and implement all the elements that aim at improving the quality of life of people in the city and responding to the growing challenges of globalization, urbanization, and global warming. The question arises of finding an adequate methodology that, given the character of the environment in question, would indicate those segments of a city that need to be first intervened about the deployment of smart technologies. Technological innovations can enhance the daily lives of residents if the technology is chosen to be as user-friendly as possible. The paper proposes the application of multi-criteria analysis and the IAHP method in solving these problems ranking indicators related to the application of technological innovations of smart city development.

Keywords: Smart City; Interval AHP; Indicators; Environment, Technological innovations

AUTOMATSKA REGULACIJA GREJANJA I PRAĆENJE POTROŠNJE TOPLOTNE ENERGIJE U JAVNIM OBJEKTIMA U REALNOM VREMENU U FUNKCIJI RAZVOJA PAMETNOG GRADA

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U cilju stvaranja što kvalitetnijih uslova za život svojih građana i doprinosu zaštite životne sredine, Kragujevac se još pre nekoliko godina opredelio za koncept pametnog grada kao jedan od pravaca svog razvoja. Ovaj koncept obuhvata pokrivanje celog grada internet mrežom, zamenu postojeće novom LED rasvetom koja će biti daljinski kontrolisana, pametni javni transport i pametno parkiranje, umrežavanje svih gradskih preduzeća i službi, razvoj geografsko- informacionog sistema, formiranje gradskog i državnog DATA centra, razvoj e- uprave, kontrolu kvaliteta vazduha, postavljanje senzora za upravljanje otpadom, kamere za video nadzor, praćenje nivoa buke, kao i pametno merenje potrošnje energije u svrhu efikasnog korišćenja energije.

Pametno merenje i praćenje potrošnje energije u realnom vremenu je svakako jedna od značajnih komponenti ovog pravca razvoja. Jedan od prvih koraka je bilo postavljanje softvera za praćanje potrošnje energije (vode, toplotne i električne energije) u realnom vremenu u Zgradi grada, a onda i ugradnja merno regulacione opreme u podstanicama objekata škola koji se greju na daljinsko grejanje. Ova oprema omogućava automatsku regulaciju grejanja u ovim objektima u zavisnosti od spoljašnje temperature i praćenje potrošnje toplotne energije u realnom vremenu. Na taj način se postiže regulacija temperature fluida u odnosu na spoljašnju temperature. U toku 2017. godine godine je u 10 objekata - 6 osnovnih, 3 srednje i u jednoj specijalnoj školi, ugrađena merno-regulaciona oprema. Oprema omogućava, pored podešavanje jačine grejanja u skladu sa spoljašnjom temperaturom, i da se grejanje isključuje parcijalno, u pojedinim delovima objektima, kao i da se isključuje u toku raspusta i vikenda, kada u školama nema korisnika.

U radu je prikazano koja je oprema ugrađena, kao i način praćanja potrošnje energije. Takođe su prikazani efekti uštede koja je postignuta ugradnjom ove opreme- u energiji i emisiji CO_2, a samim tim i delovanje na životnu sredinu.

Ključne reči: pametan grad, potrošnja energije u daljinskom grejanju, energetska efikasnost, zaštita životne sredine, emisija CO_2.

AUTOMATIC REGULATION OF HEATING AND REAL-TIME MONITORING OF THERMAL ENERGY CONSUMPTION IN PUBLIC FACILITIES FOR THE PURPOSE OF THE SMART CITY DEVELOPMENT

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A few years ago, in order to create the best possible living conditions for its citizens and contribute to environmental protection, the City of Kragujevac opted for the smart city concept as one of the directions of its development. This concept includes covering the entire city with an internet network, replacing the existing lighting with remote controlled LED lighting, smart public transportation and smart parking, networking of all city companies and services, development of geographical-information system, establishing the city and state DATA center, development of e-government, air quality control, installation of waste management sensors, video surveillance cameras, noise level monitoring, as well as smart metering of energy consumption for the purpose of efficient use of energy.
Smart metering and real-time monitoring of energy consumption is certainly one of the significant components of this direction of development. One of the first steps was the installation of real-time monitoring software for the energy consumption (water, heat and electricity) in the City Hall Building, and then the installation of metering and regulation equipment in the district heating substations in the school facilities. This equipment enables automatic regulation of heating in these buildings depending on the outside temperature and real-time monitoring of heat consumption. Thus, the fluid temperature is regulated relative to the outside temperature.
During 2017, measuring and regulating equipment was installed in ten buildings - six primary, three secondary and in one special education school. In addition to adjusting the heating intensity according to the outside temperature, the equipment enables the heating to be switched off partially, in some parts of the buildings, as well as during holidays and on weekends, when there are no users in schools.
The paper shows which equipment is installed, as well as how energy consumption is monitored. The effects of the savings – in energy and CO_2 emissions – achieved by the installation of this equipment, and thus the environmental impact, are also presented.

Keywords: smart city, district heating energy consumption, energy efficiency, environmental protection, emissions of CO_2.

АУТОНОМНИ АУТОМОБИЛИ И ОДРЖИВИ ТРАНСПОРТ У РАЗВОЈУ "ПАМЕТНОГ ГРАДА"

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Током самита Уједињених нација о одрживом развоју у септембру 2015. је препознат однос између градова, одрживог развоја и социо-економских фактора насеља и природних ресурса. Ради тога је усвојен циљ 11, Агенде одрживог развоја 2030 који гласи: „Учинити градове и друге насеобине инклузивним, безбедним , отпорним и одрживим“. Одржив саобраћај је основ развоја сваког града и доноси разне бенефите његовим становницима (унапређење урбане безбедности, корак ближе инклузивом друштву и многе друге). Четврта индустријска револуција се заснива на развоју многих технолошких иновација, а значајан број њих дешава се у аутомобилској индустрији.
Много је разних промена, а једна од најинтригантнијих је и трка на тржишту; ко ће пре развити аутономан аутомобил. Велик део ресурса аутомобилске индустрије се улаже у развој нових технологија, које су условљене захтевним корисничким искуством са једне стране, и строгим сигурносним стандардима са друге стране. Такође се улажу велики напори у интеграцију различитих технологија у оквиру једног возила, а софтверска решења преузимају механички систем надгледања. Апликације са високим степеном аутоматизоване вожње, могућност комуникације аутомобила са околином, као и пријатно корисничко искуство постављају нове изазове инжењерима у погледу развоја одговарајућих платформи.
Осим потребе решавања инжењерских изазова у развоју аутономних аутомобила и одрживог саобраћаја, овај рад истиче и важност доношења адекватне нормативно правне регулативе која ће елиминисати и ублажити препознате ризике. Закључак рада је да аутономни аутомобили и одржива саобраћајна инфраструктура представља основ будућег "паметног града".

Кључне речи: аутономни аутомобил, одржив саобраћај, урбани ризик, паметан град.

AUTONOMOUS CARS AND SUSTAINABLE TRANSPORT IN THE DEVELOPMENT OF A 'SMART CITY'

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During the United Nations Summit on Sustainable Development in September 2015, the relationship between cities, sustainable development and socioeconomic factors of settlement and natural resources was recognized. For this reason, goal 11 of the 2030 Sustainable Development Agenda was adopted, and states: "To make cities and other communities inclusive, safe, resilient and sustainable." Sustainable transport is the basis of every city's development and brings various benefits to its inhabitants (improvement of urban security, a step closer to an inclusive society and many others). The fourth industrial revolution is based on the development of numerous technological innovations, and a significant number of them are happening in the automotive industry.

There are many different changes, and one of the most intriguing is the race on the market; who will develop an autonomous car sooner. Many of the automotive industry resources are invested in the development of new technologies, driven by demanding customer experience on the one hand, and stringent safety standards on the other. Greater efforts are also being made to integrate different technologies within a single vehicle, and software solutions are taking over the machine monitoring system. Applications with a high degree of automated driving, the ability to communicate with the environment, and a comfortable user experience pose new challenges for engineers to develop appropriate platforms.

In addition to addressing the engineering challenges of developing autonomous cars and sustainable transportation, this paper also emphasizes the importance of adopting an adequate regulatory framework that will eliminate and mitigate identified risks. The conclusion of the paper is that autonomous cars and sustainable transport infrastructure form the basis of a future "smart city".

Keywords: autonomous car, sustainable transport, urban risk, smart city.

VIŠEKRITERIJUMSKA ANALIZA INDIKATORA ZA RAZVOJ PAMETNIH GRADOVA SA ASPEKTA PRIMENE OIE

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Gradove čine potencijalno pametne moderne digitalne tehnologije koje pružaju bolje usluge građanima, veće korišćenje resursa i manje štetnog uticaja na okolinu. Shvatajući ekološke i društvene kontekste grada, njegove prioritetne aktivnosti i specifične karakteristike, postaje važno uspostaviti metodologiju koja će pomoći u pronalaženju optimalnog puta do pametnog grada. Obnovljiva energija za održive kapacitete predstavljaju važan podsticaj za implementaciju obnovljivih izvora energije u cilju razvoja pametnog grada. Integralni pristup zasnovan na matematičkoj metodi fazni analitički hijerarhijski proces, fuzzi AHP, klasifikuje sistem kroz različite kriterijume i podkriterije u kojima je značajna uloga OIE. Korišćenje fleksibilnosti putem pametne mreže, zgrade, solarne energije, životne sredine, vode i otpada, predstavlja krajnju održivu strategiju u okviru koncepta pametnog grada. Cilj ovog rada je da istakne neophodnost implementacije energetski efikasne i održive gradske infrastrukture koja bi trebalo da obezbedi korišćenje prirodnih resursa I očuvanje životne sredine. Predloženi metod rangira kriterijume sa ciljem pronalaženja optimalnog pristupa implementaciji obnovljivih izvora energije u dizajniranju koncepta pametnog grada.

Ključne reči: razvoj pametnog grada; fazni analitički hijerarhijski proces; OIE; životna sredina; prirodni resursi.

MULTI-CRITERIA ANALYSIS OF SMART CITY INDICATORS FROM THE APPLICATION OF RES

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Cities are potentially smart modern digital technologies that provide better services to citizens, greater use of natural resources and less harmful impacts on the environment. The ecological and social contexts of the city, its priority activities and specific features, become significant to the concern of the optimal way towards a smart city. The renewable energy sources for sustainable capacities represent essential incentives for renewable energy implementation in order of smart city development. An integral approach based on mathematical method fuzzy AHP has been used to classifies the whole system into different criteria and sub-criteria in which the role of RES is significant. Using flexibility through a smart grid, buildings, solar energy, environment, water and waste, is the ultimate sustainability strategy within a smart city concept. The aim of this paper is the highlight of the necessity of implementing an energy efficient and sustainable urban infrastructure which should enable the use of natural resources and environmental protection. The proposed method ranks the criteria in order to find an optimal approach to the implementation of RES in the design of the smart city concept.

Keywords: Smart City Development; Fuzzy AHP; RES; Environment, Natural Resources.

PRIMENA DEA METODE U ODREĐIVANJU EFIKASNOSTI ROBOTIKE U INDUSTRIJSKOJ PROIZVODNJI

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U poređenju sa starijim vrstama mašina roboti u industriji zamenjuju ljudski rad, jer smanjuju potrebu za intervencijama ljudi u automatizovanim procesima. Oni se u industriji najviše primenjuju prilikom sklapanja, doziranja, rukovanja, obrade i zavarivanja, a te aktivnosti su preovlađujuće u industriji proizvodnje kao i u procesu kontrole. Kako bi se procenila efikasnost robota u industriji određenih zemalja u odnosu na ostvarenu vrednost proizvodnje, sprovedena je DEA analiza efikasnosti. Ova analiza je pokazala da su od analiziranih 11 zemalja najefikasnije Nemačka, Francuska, Slovenija i Norveška, dok su Češka, Španija, Italija, Mađarska, Austrija, Portugalija i Slovačka efikasne 55,41%, 62,00%, 62,07%, 89,47%, 93,37%, 89,30% i 46,84%, respektivno.

Ključne reči: roboti u industriji, DEA analiza, efikasnost, vrednost proizvodnje.

APPLICATION OF THE DEA METHOD IN DETERMINING THE EFFICIENCY OF ROBOTICS IN INDUSTRIAL PRODUCTION

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Compared to older machine types, robots in industry are replacing human labor as they reduce the need for human intervention in automated processes. Robots in industry are most commonly used in assembly, dosing, handling, processing and welding, and these activities are more prevalent in the manufacturing industry, as well as in the control process. In order to evaluate the impact of robots in industry of certain countries, in relation to the generated production value, a DEA efficiency analysis was conducted. This analysis has shown that Germany, France, Slovenia and Norway are the most efficient among the analyzed 11 countries, while Czech Republic, Spain, Italy, Hungary, Austria, Portugal, and Slovakia have efficiency value of: 55.41%, 62.00%, 62.07%, 89.47%, 93.37%, 89.30% and 46.84%, respectively.

Keywords: robots in industry, DEA analysis, efficiency, production value.

ZNAČAJ PRIMENE VEŠTAČKE INTELIGENCIJE I FARMACEUTSKIH ROBOTA U SMANJENJU RIZIKA PO LJUDE I ŽIVOTNU SREDINU

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Primena veštačke inteligencije i farmaceutskih robota u medicini i farmaciji je u konstantnom rastu kod razvijenih zemalja poslednjih desetak godina. Prvenstveno zbog smanjivanja troškova nabavke ali i niza prednosti svoje primene. Primenjuju se u proizvodnji, skladištenju, manipulaciji, doziranju lekova i pakovanju. Kao najčešća primena farmaceutskih robota, u ovom momentu, je u pakovanju i izdavanju lekova na recept. Kao glavne prednosti primene farmaceutskih robota u odnosu na radnu i životnu sredinu možemo navesti: smanjenje greške pri izdavanju lekova, smanjenje količine farmaceutskog otpada, značajno smanjenje rizika po radnu i životnu sredinu jer roboti mogu raditi u sterilnim i nepovoljnim uslovima (niske temperature), sa opasnim materijama po ljude. Farmaceutski roboti nude i zaštitu od nasilnog obijanja i uzimanja lekova bez recepta. Primena farmaceutskih robota u praksi će u velikoj meri u skoroj budućnosti radikalno promeniti način rada farmaceutskog sektora. Ovaj rad se bavi istraživanjem koliko su studenti farmaceutskih fakulteta upoznati sa ovom tehnologijom i njihovim prednostima. Rezultati istraživanja nedvosmisleno pokazuju da studenti farmaceutskih fakulteta, u zemljama začadnog Balkana, nisu u upoznati sa tehnologijom farmaceutskih robota pa ni sa njihovim prednostima primene.

Ključne reči: farmaceutski roboti, veštačka inteligencija, radna i životna sredina.

THE IMPORTANCE OF THE APPLICATION OF ARTIFICIAL INTELLIGENCE AND PHARMACEUTICAL ROBOTS IN RISK REDUCTION FOR HUMANS AND THE ENVIRONMENT

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The use of artificial intelligence and pharmaceutical robots in medicine and pharmacy has been growing steadily in developed countries over the last ten to twenty years. Primarily due to reduced procurement costs, but also a number of advantages of its implementation, the application of these systems is growing. These systems are used in manufacturing, storage, handling, drug dosing and packaging. The most common area of application for pharmaceutical robots at the moment is in the packaging and dispensing of prescription drugs. The main advantages of using pharmaceutical robots in relation to work and environment are: reduction of medication error, reduction of pharmaceutical waste, significant reduction of risk to work and environment, since robots can operate in sterile and unfavorable conditions (low temperatures), with hazardous substances to humans. Pharmaceutical robots also offer protection against violent bypassing and taking over-the-counter drugs. The application of pharmaceutical robots in practice will greatly change the way the pharmaceutical sector operates in the near future. This paper examines how well students of pharmacy colleges are aware of this technology and their benefits. The results of the research clearly show that students in the faculties of pharmacy in the Western Balkan countries are not familiar with the technology of pharmaceutical robots or their benefits.

Keywords: pharmaceutical robots, artificial intelligence, work and environment.

ROBOTIKA I SPORT

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Istraživanja u oblasti savremenog sporta prepoznaju njegovu kompleksnost i samim tim direktnu povezanost sa brojnim naučnim disciplinama koje na prvi pogled nemaju dodirnih tačaka sa sportom ili je čak smatraju nemogućom. Robotika, kao jedna od mlađih naučnih disciplina poslednjih godina nalazi svoje mesto u oblasti sporta, kako u industriji sporta, tako i u njenom trenažnom, čak i u takmičarskom segmentu. Polje robotike svojim razvojem uporedo otkriva nove mogućnosti svoje primene, odnosno primene veštačke inteligencije (AI). Nakon angažovanje robota u kućnim poslovima, industriji, vojsci, njihova implementacija na polju sporta predstavlja izazov za naučnike koji se bave ovom oblašću.
Kroz istoriju sporta u širem smislu, između ostalog, možemo sagledati razvoj sportskih grana pod uticajem različitih tehnologija kao i uvođenje novih sportskih grana, za koje smo mislili da se nikad neće pridružiti oblasti sporta, poput brejkdensa, skejtbordinga i dr. Iako se među istraživačima u oblasti sporta vode brojne polemike da li „e-igre“ mogu biti sport s obzirom da imaju svoja takmičenja, a čak se diskutovalo i o mogućnosti njihovog uvrštavanja u takmičarski program Olimpijskih igara, to navodi na mogućnost uključivanja takmičenja samih robota u bliskoj budućnosti. Potvrdu tvrdnje da je nagli razvoj kompjuterskih tehnologija uticao na potrebu da se u tom smislu uvedu promene i u sportu nalazimo u sportskom takmičenju pod nazivom Cibatlon (Cybathlon), koje pripada domenu robotike a prvi put je održano 2016. godine u Cirihu. Cilj ovog takmičenja je da obezbedi platformu za razvoj nove asistivne tehnologije. Dodela medalja takmičaru i proizvođaču ukazuje na značaj i povezanost nauke u oblasti robotike, sporta i industrije.
Neophodno je imati u vidu činjenicu da razni patenti, sprave i trenažeri koji su prisutni u sportu iako su u funkciji poboljšanja velikog broja aspekata u sportu, ne pripadaju domenu robotike, već domenu napredne tehnologije. Tako npr. primena nanotehnologije ima potencijal da poboljša performanse modifikovane sportske opreme kao i funkciju poboljšanja sigurnosti, performansi, udobnosti i ublažavanja povreda.
Evolucija robotike u smislu interakcije sa ljudima u skoro svakom mogućem okruženju predstavlja potrebu za daljim razvojem tehnologije koja se nalazi na preseku veštačke inteligencije (AI) i interakcije između čoveka i robota (HRI).
Kada je Gari Kasparov, najbolji šahista svih vremena 1997. godine igrao meč protiv kompjutera, smatralo se atrakcijom. Danas povezanost robotike i sporta možemo uočiti u sledećim slučajevima: roboti koji pomažu u pružanju podrške sportskog treninga, roboti koji zamenjuju ljude tokom obuke, roboti koji služe kao modeli stvarnih sportskih performansi, roboti koji učestvuju u takmičenju protiv ljudi i roboti koji pomažu organizatorima sportskih događaja.
Sport kao naučna disciplina odavno je izašao iz okvira trenažne tehnologije i njegovog pedagoškog ili zdravstvenog aspekta. S obzirom da se svet tehnologije vidljivo približio svetu sporta i postao njegov sastavni deo, nameće se pitanje budućnosti sporta. Takođe, da li prisustvo robotike u sportu otvara pitanje etike u sportu. Postojeće definicije sporta verovatno će u skoroj budućnosti pretrpeti korekcije i dopune jer postoji mogućnost da sport koji se menjao kroz istoriju, sada udružen sa veštačkom inteligencijom predstavi novu eru sporta.

Ključne reči: sport, robotika, industrija

ROBOTICS AND SPORTS

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Modern sports research recognizes its complexity and thus its direct connection with numerous scientific disciplines that at first glance have no points of contact with sports or even consider it impossible. Robotics, as one of the younger scientific disciplines in recent years, finds its place in the field of sports, both in the sports industry and in its training, even in the competitive segment. With its development, the field of robotics simultaneously reveals new possibilities of its application, i.e. the application of artificial intelligence (AI). After hiring robots in household chores, industry, the army, their implementation in the field of sports is a challenge for scientists working in this field.

Throughout the history of sports in a broader sense, among other things, we can see the development of sports under the influence of various technologies and the introduction of new sports, which we thought would never join sports, such as breakdance, skateboarding and others. Although there is a lot of controversy among researchers in the field of sports whether "e-games" can be a sport given that they have their own competitions, and even discussed the possibility of including them in the competition program of the Olympic Games, this suggests the possibility of including robots in the near future. Confirmation of the claim that the rapid development of computer technologies has influenced the need to introduce changes in that sense in sports can be found in the sports competition called Cybathlon, which belongs to the domain of robotics and was first held in 2016 in Zurich. The goal of this competition is to provide a platform for the development of new assistive technology. The awarding of medals to the competitor and the manufacturer indicates the importance and connection of science in the field of robotics, sports and industry.

It is necessary to keep in mind the fact that various patents, devices and training machines that are present in sports, although in the function of improving a large number of aspects in sports, do not belong to the domain of robotics, but to the domain of advanced technology. Thus, the application of nanotechnology has the potential to improve the performance of modified sports equipment as well as the function of improving safety, performance, comfort and injury reduction.

The evolution of robotics in terms of interaction with humans in almost every possible environment represents the need for further development of technology that is at the intersection of artificial intelligence (AI) and human-robot interaction (HRI).

When Gary Kasparov, the best chess player of all time, played a match against computer in 1997, it was considered an attraction. Today, the connection between robotics and sports can be seen in the following cases: robots that help support sports training, robots that replace people during training, robots that serve as models of real sports performance, robots that participate in competitions against people and robots that help sports event organizers.

Sport as a scientific discipline has long gone beyond the framework of training technology and its pedagogical or health aspect. Given that the world of technology has visibly approached the world of sports and become an integral part of it, the question of the future of sports arises. Also, whether the presence of robotics in sports raises the question of ethics in sports. The existing definitions of sport are likely to suffer corrections and amendments in the near future as there is a possibility that the sport that has changed throughout history, now combined with artificial intelligence launch a new era of sports.

Keywords: sport, robotics, industry.

KOMUNIKACIJE I ZELENA EKONOMIJA KROZ PRIMENU NOVIH TEHNOLOGIJA I INOVACIJA

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Cilj ovog rada je da se stekne potpuniji uvid o važnosti sprege ekologije, tehnologije, komunikacija i multimedija u poslovnim sistemima za rešavanje ekoloških problema. Ekonomski razvoj uz očuvanje zdrave životne sredine treba da bude prioritet za svaku zajednicu. Bliži se vreme kada će svako, u bilo kojem trenutku, moći da dođe do bilo kojeg informatičkog proizvoda, bez obzira na svoju lokaciju. Ovo podrazumeva dvostranu razmenu informacija između pojedinaca ili pojedinaca i kompjuterskih programa (sistema) o mnogim temama, pa i ekološkim. Bez inovacija, čitav poduhvat unapređenja tehnologije bio bi nemoguć. Nove tehnologije, organizacije proizvodnje, tržišta i ekonomije otvaraju novu etapu opšteg društvenog razvoja, ali svakako drugačiju – eru pitanja i problema zelene ekonomije. Budućnost koja dolazi ispostavlja zadatak razumevanja najbitnijih elemenata jedne ovakve ere, kao i njene tendencije skopčane s primenom u poslovnim sistemima kako bi se razvila i jačala svest zaposlenih, ali i svih građana Srbije u delu očuvanja životne sredine i zaštite biodiverziteta. Osmišljavanju delatnosti i institucija koje će ovu problematiku razvijati mora se pristupiti na način da korist od nje bude što univerzalnija, posebno ona koja se tiče ekološkog informisanja, ekološkog obrazovanja i telekomunikacija.

Ključne reči: zelena ekonomija, komunikacije, tehnologija, multimediji, inovacije.

COMMUNICATIONS AND GREEN ECONOMY THROUGH THE IMPLEMENTATION OF NEW TECHNOLOGIES AND INNOVATIONS

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The aim of this work is to obtain a complete insight on the importance of collusion between ecology, technology, communication and multimedia in business systems for solving environmental problems. Economic development with the preservation of a healthy environment should be a priority for every community. We are closer to the time when everyone will, at any time, be able to reach any IT product, regardless of the location. This includes bilateral exchange of information between individuals or individuals and computer programs (system) on many topics, including environmental. Without innovation, the entire project to improve the technology would be impossible. New technologies, organization of production, markets and economies open up a new phase of general social development, but certainly different - the era of issues and problems green economy. The future that comes turns out the task of understanding the most important elements of such an era, as well as its tendency constituted by the application of the business systems in order to develop and strengthen the awareness of employees, but also all the citizens of Serbia in the work of environmental protection and biodiversity conservation. Design activities and institutions that will develop these issues must be approached in a way to benefit from it is as universal, especially those concerning environmental information, environmental education and telecommunications.

Keywords: green economy, communications, technology, multimedia, innovations.

PRIMENA NANOTEHNOLOGIJE U SPORTU

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Nanotehnologija se danas nalazi među tehnološkim granama koje se veoma brzo razvijaju i svoju primenu nalaze u svim segmentima svakodnevnog života. Ona podrazumeva manipulaciju materijom koja se koristi u određenim primenama pomoću definisanih hemijskih i/ili fizičkih procesa radi stvaranja materijala sa poboljšanim svojstvima. Iako sami istraživači smatraju nanotehnologiju mladom naukom, evidentno je da ima široku lepezu mogućih oblasti svoje primene, gde je sport zauzeo značajno mesto. Njena primena u sportu je primetna od kraja prošlog veka i to u izradi sportskih rekvizita, sportske opreme, pa čak i u sportskoj medicini. Poboljšavaju se performanse modifikovane sportske opreme, kao što su teniski reket, lopte, dok u drugim granama sporta njena primena je u funkciji poboljšanja sigurnosti, performansi, udobnosti i ublažavanja povreda. Nanotehnologija je sastavni deo mnogih sportskih brendova i proizvoda kompanija već više od dve decenije. Proizvođači sportske opreme sa svojim istraživačkim timovima u želji da stvore najinovativniju opremu za poboljšanje performansi sportista koriste najnovije tehnologije. Nanotehnologija podstiče sportistu da postane bolji i da ispravi manje greške čime poboljšava svoj nivo efikasnosti i time donosi napredak u polju sporta i privlačenje više ljudi ka sportu.

Primena nanotehnologije u sportu podrazumeva upotrebu različitih elemenata i materijala koji se uklapaju u specifičnu sportsku opremu i odeću. Posebno utiču materijali izrađeni od karbonskih nanocevčica (CNT) koji su čvrsti kao dijamant i preko sto puta jači i 6 puta lakši od čelika. Karbonske nanocevčice su 17 puta jače od ugljeničnih vlakana i preko 300 puta su jače od aluminijumskih, što je najnaprednija tehnologija koja se koristi u sportu. Materijali koji se koriste u sportu su na ovaj način snažno ojačani dok im je težina olakšana. Nano-poboljšana oprema upotrebljava se u tenisu, golfu, biciklizmu, skijanju i snoubordingu, bejzbolu, plivanju. Pored toga, razvijaju se srebrne nanočestice koje otklanjaju mirise u proizvodnji čarapa i druge sportske opreme.

Evropska platforma za inovacije u sportu (EPSI) je razvila i publikovala Strategijsku agendu istraživanja i inovacija za period 2016-2021, kao rezultat snažne i temeljne saradnje konsultacije među svojim članovima. Osnova ovog rada je pažljiva razmatranje i analiza mnogih publikacija, među kojima je „Vodeće globalne inovacije u sportu“. Namena dokumenta je usmerena na buduće akcije evropskog sektora sporta, posebno u okviru okvirnog programa H 2020. Ovaj dokument Identifikuje mogućnosti za inovacije i predlaže misiju orijentisanu ka istraživanju i razvoju sporta koji će udovoljiti njegovim zdravstvenim, socijalnim, ekološkim i tržišnim potrebama.

Većina istraživača koja je razmatrala primenu nanotehnologije u sportu ostavljala je kao otvoreno pitanje štetnost njene primene na samog čoveka i životnu sredinu, dok

su rezultati istraživanja sprovedenih u oblasti informacionih tehnologija jasno ukazali i definisali prednosti i mane ove tehnološke grane. Imajući u vidu da su prisutni rizici upotrebe nanotehnoloških proizvoda koji evidentno poboljšavaju performanse prethodnih sportskih proizvoda, postavlja se pitanje u kojoj meri savremena tehnologija šteti čoveku i da li cilj opravdava sredstvo. Da li se zarad vrhunskih rezultata u sportu odričemo prava na zdrav život. Paradoks je da kad se govori o sportu, podrazumeva se zdrav način vođenja života. Međutim, upotreba nanotehnologije u sportu otvara još jedno pitanje – pitanje etike/bioetike u sportu. Da li je upotreba sportske opreme i rekvizita koji su proizvedeni primenom nanotehnologije jedna vrsta dopinga. Za sada sportski stručnjaci smatraju da sve što nije zabranjeno pravilima, dozvoljeno je za upotrebu. Evidentno je da nanotehnologija u sportu ima i pozitivne i negativne uticaje. Prateći trenutne trendove, pretpostavka je da u bliskoj budućnosti mogu se očekivati nova rešenja zahvaljujući primeni nanotehnologije u sportu. Očekuje se da će nanotehnologija imati ogroman razvoj u sportu.

Ključne reči: sportski proizvod, nanotehnologija, rizik

APPLICATION OF NANOTECHNOLOGY IN SPORT

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Nanotechnology is one of the fastest growing technological branches and it is applied to almost all segments of everyday life. It involves the manipulation of a substance used in certain applications using defined chemical and / or physical processes to create materials with improved properties. Although researchers themselves consider nanotechnology a young science, it has a wide range of possible areas of application, where sport evidently has taken a significant place. Its use in sports has been notable since the end of the last century, in the manufacture of sports suits, sports equipment and even in the sports medicine. The performance of modified sports equipment, such as tennis racket, balls is improved, while in other branches of sport its application is in the function of improving safety, performance, comfort and mitigation of injuries. Nanotechnology has been an integral part of many sports brands and products of companies for more than two decades. Sports equipment manufacturers with their research teams use the latest technologies in order to create the most innovative equipment to improve the performance of athletes. Nanotechnology encourages the athlete to become better and to correct minor mistakes, thus improving his level of efficiency and thus bringing progress in the field of sports and attracting more people to sports.

The application of nanotechnology in sports implies the use of various elements and materials that fit into specific sports equipment and clothing. Materials made of carbon nanotubes (CNTs), which are as strong as diamonds and over a hundred times stronger and 6 times lighter than steel, are particularly affected. Carbon nanotubes are 17 times stronger than carbon fibers and over 300 times stronger than aluminum, which is the most advanced technology used in sports. The materials used in sports are strongly reinforced in this way while their weight is lightened. Nano-improved equipment is used in tennis, golf, cycling, skiing and snowboarding, baseball, swimming. In addition, silver nanoparticles are being developed that eliminate odors in the production of socks and other sports equipment.
The European Platform for Sport Innovation (EPSI) has developed and published a Strategic Research and Innovation Agenda for the period 2016-2021, as a result of strong and thorough consultation cooperation among its members. The basis of this paper is a careful consideration and analysis of many publications, including "Leading Global Innovations in Sports". The purpose of the document is focused on future actions of the European sports sector, especially within the framework program H 2020. This document identifies opportunities for innovation and proposes a mission oriented towards research and development of sports that will meet its health, social, environmental and market needs.
The majority of researchers considering the use of nanotechnology in sports have left open the question of the harmfulness its use causes to the humans and the environment, while the results of the research conducted in the field of information technology have clearly identified and defined the advantages and disadvantages of this technology industry. Considering that there are risks of using nanotechnological products that evidently improve the performance of the sports products, the question arises to what extent modern technology is harmful to humans and whether the goal justifies the means. Do we forfeit our right to a healthy life for the sake of top results in sports? The paradox is that when it comes to sports, by default, keeping a healthy way of life is expected. However, the use of nanotechnology in sport raises another issue - the issue of ethics/bioethics in sport. Should the use of sports suits and equipment manufactured using nanotechnology, be considered as a type of doping? For now, sports experts believe that everything is allowed for use as long as it is not forbidden by the rules. It is evident that nanotechnology in sports has both positive and negative impacts. Following the current trends, the assumption is that new solutions can be expected in the near future thanks to the application of nanotechnology in sports. Nanotechnology is expected to have a huge development in sports.

Keywords: sports' product, nanotechnology, risk.

PRIMENA "KONCEPTA PAMETNOG GRADA" KROZ EFIKASNIJE PRIKUPLJANJE RECIKLAŽNOG OTPADA

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Koncept „pametnog grada“ (smart city) je pristup celovitog i dugoročno održivog načina urbanog življenja, koji respektuje kvalitet života u zajednici, ali i životnu sredinu. Ovaj savremeni pristup se temelji na: upotrebi „pametnih mreža“ i informaciono-komunikacionih tehnologija, sveukupnom smanjenju nastalog zagađenja, uvođenju inteligentnih transportnih sistema, povećanju energetske efikasnosti i drugim inovativnim „zelenim rešenjima“ u oblasti građevinarstva. Posebno, ovaj koncept se zasniva i na reciklaži jer ona predstavlja jedan od prioriteta u oblasti upravljanja otpadom i čini veliki deo moderne („zelene“ i „cirkularne“) ekonomije. Logistički troškovi imaju značajan udeo u sveukupnim troškovima recikliranja. Konvencionalne metode sakupljanja reciklažnog otpada su neefikasne i opterećene troškovima i zato ostavljaju malo prostora za finansijski podsticaj, kako za reciklažne kompanije, tako i za entitete koji generišu reciklažni otpad. Globalno posmatrano, to predstavlja prepreku ka još većem obimu reciklaže. Ovaj rad predlaže način da se taj problem ublaži u vidu digitalne platforme koja za cilj ima efikasnije korišćenja vozila u prikupljanju reciklažnog otpada i samim tim, smanjenju ukupnih troškova reciklaže. Ovo je naročito ekonomski opravdano i primenjivo u situacijama kada postoji veliki broj različitih entiteta koji generišu relativno male količine reciklažnog otpada.

Ključne reči: smart siti; reciklaža; sakupljanje reciklažnog otpada; digitalna platforma; on-lajn recikliranje.

APPLICATION OF THE "SMART CITY CONCEPT" THROUGH EFFICIENT RECYCLABLE WASTE COLLECTION

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“Smart city” concept is a comprehensive and long-term approach towards sustainable urban living, while respecting the environment. This modern approach is based on: “smart grids”, information and communication technologies, the overall reduction of generated pollution, the introduction of intelligent transport systems, the increase in energy efficiency and other innovative “green solutions” in the field of civil engineering. In particular, this concept is based on recycling, which is one of the priorities in the waste management field and makes a large part of the modern (“green” and “circular”) economy. Logistic costs account for a significant share in overall recycling costs. Conventional recyclable waste collection methods are inefficient and economically burdened and therefore leave a small space for financial incentives, both for recycling companies and entities that generate recyclable waste. Globally, this is an obstacle to an even greater extent of recycling. This paper proposes a way to alleviate this problem in the form of a digital platform that aims to make more efficient use of vehicles in the recyclable waste collection and therefore reduce total recycling costs. This is particularly economically justifiable and applicable in situations where there are many different entities that generate relatively small amounts of recyclable waste.

Key words: smart city; recycling; recyclable waste collection; digital platform; on-line recycling.

APPLICATION OF IoT FOR MONITORING OF SOIL-LEVEL CARBON DIOXIDE IN THE MAN-MADE AREA

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The concentrations of above-ground carbon dioxide were measured within the Unalsky tailings storage facility, where waste from the Mizur polymetallic mine was stored. Measurements were carried out at 6 sites with different levels of heavy metal contamination in combination with other parameters: determining the concentrations of zinc, cadmium, copper and lead in soils and plants, assessing the biodiversity of meadow communities, fluctuating asymmetry of birch leaves, enzyme activity, hemoglobin levels, plant pigments, etc. The following sensors were used: temperature and humidity converter T 3510 (Czech Republic), CO_2 concentration converter T 5540 (Czech Republic), radon sensor or radon indicator RADEX MR107 (Russia). It was found that a sharp technogenic impact, as a rule, reduces the release of carbon dioxide from the soil. The increased content of carbon dioxide in the soil round air is also associated with the type of soil. Higher amounts of gas are released from soils enriched in organic matter. At the same time, there are significant fluctuations in carbon dioxide concentrations over time (from 10 to 50%). There were no noticeable fluctuations in radon. Its average content ranges from 37 to 50 Bq/m^3. But in most cases, it approaches 40 Bq/m^3 (background). However, the mode of changes in the concentrations of carbon dioxide and other gases should be evaluated in longer experiments with simultaneous scanning of the test soil areas.

Key words: IoT, monitoring, soils, carbon dioxide, heavy metals.

IoT U MENADŽMENTU KATASTROFALNIH DOGAĐAJA

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Zbog sve bržeg i većeg rasta broja stanovništva u velikim gradovima, loše evakuacijske infrastrukture i izloženosti teškim vremenskim događajima, zemlje u razvoju su nesrazmerno izložene rizicima prirodnih katastrofa i često imaju ograničena sredstva za ublažavanje njihovih posledica. Kao posledica toga, prema podacima Svetske banke, više od 95 procenata svih smrtnih slučajeva uzrokovanih katastrofama se događa u zemljama u razvoju. Svake godine prirodne katastrofe i katastrofe izazvane čovekom donose infrastrukturne štete, nevolje, gubitke prihoda, povređene pored ogromnog broja smrtnih slučajeva. Tokom posljednje decenije, sve veći broj “stvari“ postaju povezane na Internet. Senzori i mrežna povezanost omogućavaju tim stvarima da prate svoje okruženje, izveštavaju o svom statusu i lokaciji, primaju uputstva i čak izvršavaju radnje na osnovu podataka koje dobiju. U radu je na bazi svetske literature prikazana praktična upotreba IoT-a na primerima katastrofalnih događaja kao što su požari i poplave, kao i primena globalnog sistema za mobilne komunikacije u sistemu praćenja.

Ključne reči: IoT, menadžment, rizik, katastrofalni događaji.

IoT IN DISASTER MANAGEMENT

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Due to faster and larger population growth in big cities, poor evacuation infrastructure and exposure to severe weather events, developing countries are disproportionately exposed to natural disaster risks and often have limited resources to mitigate resources. In fact, according to World Bank data, more than 95 percent of all catastrophe deaths occurred in developing countries. Every year, natural and man-made disasters bring infrastructural damage, distress, loss of revenue, reclaiming a huge number of fatalities. During the last decade, an increasing number of "things" have become online. Sensors and network connectivity allow these things to monitor their environment, report on their status and location, receive instructions, and even perform actions on the database they receive. Based on world literature the paper presents the practical use of IoT on examples of disaster events such as fires and floods, as well as the application of a global mobile communications system to a monitoring system.

Keywords: IoT, management, risk, disaster events.

ПАМЕТНИ ГРАДОВИ: ОД УРБАНОГ РАЗВОЈА ДО ДИГИТАЛНЕ ИНФРАСТРУКТУРЕ И САЈБЕР БЕЗБЕДНОСТИ

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Паметни градови заједно доносе инфраструктуру и технологију како би побољшали квалитет живота грађана и побољшали њихову интеракцију са урбаним окружењем. Дакле, град будућности биће паметан. Све ће бити повезано, од регулације саобраћаја, преко штедње енергије, бесплатан Wi-Fi широм града, па све до борбе са криминалом. А све то захваљујући базама података и Интернет интелигентних уређаја (IoT). Врли нови свет или присмотра на сваком кораку? Како би могли изгледати паметни градови будућности? Желимо ли заиста да живимо у њима? Каква је безбедност података? То је тема овог рада.

Кључне речи: паметни градови, базе података, интернет интелигентних уређаја, квалитет живота, сајбер безбедност.

SMART CITIES: FROM URBAN DEVELOPMENT TO THE DIGITAL INFRASTRUCTURE AND CYBERSECURITY

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Smart cities bring together infrastructure and technology to improve the quality of life of citizens and boost their interactions with the urban environment. So, the city of the future will be smart. It is entirely interconnected with traffic regulation, save energy, free city-wide Wi-Fi, fight crime. Assisted by Big Data and the Internet of Things (IoT). Brave new world or rather a surveillance nightmare? What smart cities look like? And do we want to live there? Data security? That is the topic of this paper.

Keywords: smart cities, big data, IoT, quality of life, cybersecurity.

ZNAČAJ INFORMACIONIH TEHNOLOGIJA U FORMIRANJU MODELA ODRŽIVOG RAZVOJA

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Industrijski, naučni i tehnološki napredak, kao i svetska populacija danas doveli su do situacije u kojoj je obezbeđivanje održivog razvoja možda jedina šansa za opstanak. Identifikovana pitanja održivog razvoja i pokušaji pronalaženja rešenja mogu se videti u gotovo svim sektorima informacionih i komunikacionih tehnologija. To je skup znanja, metoda, tehnika i tehničke opreme koja pomoću računara i komunikacija obezbeđuje prikupljanje, čuvanje i distribuciju bilo kojih podataka. Stoga pružaju alate koji se mogu koristiti za rešavanje problema od interesa u svim sektorima.

Model održivog razvoja je nastao kao rezultat pokušaja da se reše ekološki problemi sa kojima se savremeno društvo suočava. To je rast i razvoj koji omogućava zadovoljenje potreba sadašnjih, koji nije na štetu budućih generacija. Takav rast i razvoj omogućava ostvarenje ekonomskih rezultata, podstiče socijalnu jednakost, štiti prirodne resurse i životnu sredinu i održiv je u dugom roku. Njegova primena podrazumeva uvažavanje ekonomskih, ekoloških i socijalnih principa. To je jedan od najznačajnijih izazova sa kojim se savremeno društvo suočava. On predstavlja ekonomski rast i razvoj koji uvažava i ekološke i socijalne aspekte rasta i razvoja i počiva na tri glavna stuba: ekonomskom, ekološkom i socijalnom.

Današnje informaciono društvo gradi se na tehnologiji, znanju i inteligenciji. Informaciona tehnologija opslužuje ljude i mašine informacijama, koje se transformišu u znanje i inteligenciju. Odgovarajuća upotreba znanja od strane ljudi i mašina doprinosi održivom razvoju. Informacione tehnologije donose brojne prednosti u pogledu bolje efikasnosti poslovanja i bržem pristupu neophodnim podacima u bilo koje vreme i na bilo kojoj lokaciji. Informacione tehnologije u današnje vreme predstavljaju značajan alat za ostvarenje modela održivog rasta i razvoja.

Informacione tehnologije imaju značajan uticaj na ekonomski rast i održivi razvoj, ali u sebi sadrže i veliki potencijal za ostvarenje koncepta održivosti ekonomije i okruženja. Koncept, za razliku od pojma, „održivi razvoj“ nije novost; duboki i složeni problemi obuhvaćeni tim terminom mogu se pratiti od najranijih ljudskih civilizacija i višegodišnje napetosti između rasta stanovništva i ekonomskog razvoja, s jedne strane, i upotrebe prirodnih resursa i ekosistema s druge strane. S druge strane, primenom koncepta održivosti, informacione tehnologije postaju održive u dugom roku, čime se stvaraju mogućnosti za razvoj ove oblasti. One podstiču razvoj svesti i znanja o ekološkim aspektima svakodnevnog života i poslovanja.

Pitanje održivog razvoja je u središtu društva, postavljajući budući kurs čovečanstva na planeti. Bez obzira na tehnološke promene, moćniji računari, satelitsko nadgledanje, čak i veštačka inteligencija, pitanje održivog razvoja ostaće u osnovi isto i u budućnosti visoke tehnologije.

Problemi održivog razvoja danas se identifikuju i pokušavaju da se reše u svim poljima života. U tom pogledu informacione tehnologije igraju određenu ulogu. Razgovara se o različitim doprinosima i pretnjama koje informacione tehnologije predstavljaju održivom razvoju.

Ključne reči: zaštita životne sredine, održivost, održivi razvoj, održive informacione tehnologije.

THE IMPORTANCE OF INFORMATION TECHNOLOGIES IN CREATION OF SUSTAINABLE DEVELOPMENT MODEL

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Industrial, scientific and technological progress, as well as the world's population today, have led to a situation in which ensuring sustainable development is perhaps the only chance for survival. Identified issues of sustainable development and attempts to find solutions can be seen in almost all sectors of information and communication technologies. It is a set of knowledge, methods, techniques and technical equipment that uses computers and communications to collect, store and distribute any data. They therefore provide tools that can be used to solve problems of interest in all sectors.
The model of sustainable development was created as a result of an attempt to solve the environmental problems that modern society is facing. It is growth and development that enables the needs of the present to be met, which is not to the detriment of future generations. Such growth and development enables the achievement of economic results, encourages social equality, protects natural resources and the environment and is sustainable in the long run. Its application implies respect for economic, environmental and social principles. This is one of the most significant challenges facing modern society. It represents economic growth and development that respects both environmental and social aspects of growth and development and rests on three main pillars: economic, environmental and social. Today's information society is built on technology, knowledge and intelligence. Information technology serves people and machines with information, which is transformed into knowledge and intelligence. Appropriate use of knowledge by humans and machines contributes to sustainable development. Information technology brings numerous benefits in terms of better business efficiency and faster access to the necessary data at any time and in any location. Information technologies today are an important tool for achieving models of sustainable growth and development. Information technologies have a significant impact on economic growth and sustainable development, but they also contain great potential for achieving the concept of sustainability of the economy and the environment. The concept, unlike the term, "sustainable development" is not new; the deep and complex problems encompassed by this term can be traced back to the earliest human civilizations and the perennial tensions between population growth and economic development, on the one hand, and the use of natural resources and ecosystems, on the other. On the other hand, by applying the concept of sustainability, information technologies become sustainable in the long run, which creates opportunities for the development of this area. They encourage the development of awareness and knowledge about the environmental aspects of everyday life and business. The issue of sustainable development is at the center of society, setting the future course of humanity on the planet. Regardless of technological changes, more powerful computers, satellite surveillance, and even artificial intelligence, the issue of sustainable development will remain basically the same in the future of high technology.
Problems of sustainable development today are identified and tried to be solved in all fields of life. In this regard, information technologies play a role. The various contributions and threats that information technology poses to sustainable development are discussed.

Keywords: green economy, environmental protection, sustainability, sustainable development, sustainable information technology.

BUKA GENERISANA VAZDUŠNIM SAOBRAĆAJEM

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Rast u vazduhoplovnom sektoru od 1950-ih donio je velike koristi, ali je zabrinutost zbog povezanih uticaja na životnu sredinu sve veća. Buka generisana vazdušnim saobraćajem je postala jedan od osnovnih ekoloških problema i jedan od ograničavajućih faktora razvoja aerodroma. Upravo iz ovog razloga, ICAO je definisala "Uravnotežen pristup" upravljanju bukom u okolini aerodroma, koji obuhvata smanjenje buke na izvoru, planiranje i upravljanje korišćenjem zemljišta, operativne procedure za smanjenje buke i operativne restrikcije. Ovaj pristup preporučuje da se uvedu mere za smanjenje buke koje treba da teže kombinaciji različitih rešenja, što će aerodromima omogućiti zadovoljenje sve oštrijih međunarodnih propisa i njihov dalji razvoj. Razvoj novih tehnologija letelica i njeno uključivanje u napredne dizajne koji su čistiji i tiši, jedan je od ključnih načina za ublažavanje uticaja iz vazduhoplovstva na životnu sredinu.

Ključne reči: buka vazdušnog saobraćaja, indikatori buke, strategije upravljanja bukom, uravnotežen pristup.

NOISE GENERATED BY AIR TRAFFIC

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Growth in the aviation sector since the 1950s has brought great benefits, but concerns about the associated environmental impacts are increasing. Noise generated by air traffic has become one of the basic environmental problems and one of the limiting factors of airport development. It is for this reason that ICAO has defined a “Balanced Approach” to noise management in the vicinity of the airport, which includes source noise reduction, land use planning and management, operational noise reduction procedures and operational restrictions. This approach recommends the introducing of noise reduction measures that should strive to a combination of different solutions, which will enable for airports to meet increasingly stringing international regulations and their further development. The development of new aircraft technologies and its incorporation into advanced designs that are cleaner and quieter is one of the key ways to mitigate the environmental impact of aviation.

Keywords: air traffic noise, noise indicators, noise management strategies, balanced approach, airports.

Sekcija 3

ORGANSKA POLJOPRIVREDA I EKOTURIZAM

Section 3

ORGANIC AGRICULTURE AND ECOTOURISM

ORGANSKA HRANA U FUNKCIJI RAZVOJA RURALNOG TURIZMA

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U prirodi svakog čoveka je da konzumira hranu koju mu je priroda dala u bliskom okruženju. Hrana proizvedena organskim putem, u manje zagađenim, ruralnim sredinama predstavlja izuzetan potencijal razvoja različitih selektivnih oblika turizma a posebno ruralnog turizma. Savremeni turisti koji imaju razvijenu svest o ekološkom okruženju sve manje žele da konzumiraju hranu koja nije proizvedena na zdravstveno bezbedan način. Upravo iz tog razloga unapređenje i omasovljenje proizvodnje organske hrane predstavlja bitan ekonomski potencijal a samim tim i zagarantovanu dobit kako u agrarnom tako i u turističkom sektoru.

Ključne reči: organska hrana, ruralni turizam, životna sredina.

ORGANIC FOOD IN THE FUNCTION OF RURAL TOURISM DEVELOPMENT

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It is in the nature of every human being to consume the food that nature has given him in his close environment. Organically produced food in less polluted rural areas presents an extraordinary potential for the development of various selective forms of tourism, especially rural tourism. Modern tourists who have developed awareness of the environment are less and less eager to consume food that is not produced in a health-safe manner. For this reason, the promotion and promotion of organic food production represents an important economic potential and therefore a guaranteed profit in both the agrarian and tourism sectors.

Keywords: Organic food, rural tourism, environment.

ECONOMIC PRECONDITIONS FOR IMPORTING COWS OF MONTBÉLIARDE AND JERSEY BREEDS TO THE REGIONS OF THE CENTRAL FEDERAL DISTRICT OF RUSSIA

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Studies were carried out at a number of farms in the Voronezh region owned by Molvest agro-industrial holding. Cattle of Montbéliarde and Jersey breeds were the object of research.

Due to implementation of strategic guidelines in dairy cattle breeding, dairy cattle is being imported to the regions of the Central Federal District, including the Voronezh Region. In this regard, Montbéliarde and Jersey breeds appear to be the most optimal choice, as they are quite unpretentious in relation to climatic and feeding conditions. Cows of these breeds are also distinguished for their productive longevity, significant reproduction rates, high potential in milk productivity, sufficient rate of milk yield and milk high quality indicators.

Analyzing business activities of the Molvest agricultural holding enterprises, we could conclude that its companies occupy the third place in producing dairy products in Russia. Currently, this holding is the largest Russian producer without participation of foreign capital and having an estimated share in the federal market of about 2%. Livestock population is about 25 thousand heads. And it should be mentioned that productivity of the Jersey breed cows is 20.0 liters per day (fat content is more than 6%, and protein content is 4-4.5%), and that of Montbéliarde breed is 28.0 per day (fat content is more than 4.0%, and protein content is 3.5–4.0%). Such indicators are making milk, as a product, the most promising item in terms of its production profitability. In addition, high quality indicators of milk result in its use as the optimal raw material for manufacturing cheese and butter.

From our data, profit from selling milk amounted to 546.3 million rubles, and profitability level was 17.6%.

Thus, it could be concluded that import of these breeds creates economically advantageous preconditions for further improvement of the livestock industry in the regions of the Central Federal District.

Keywords: economy, profitability, cattle, milk, livestock industry, Central Federal District of Russia.

ECONOMIC-GEOGRAPHICAL CHARACTERISTICS OF BEEKEEPING IN THE RUSE REGION (BULGARIA)

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Beekeeping and the production of bee products is a specific activity in which heterogeneous factors interact. The main factors of competitiveness in beekeeping are formed at the regional level, but they are realized on a supra-regional basis, which is why a marketing strategy is needed to develop the potential and competitiveness of beekeeping in the Rousse district, the starting point of which is the economic and geographical characteristic of the area.
There is a discrepancy between the natural zoning of the Danube plain and the administrative and territorial structure of the Ruse region. The hilly nature of the relief, the relatively low altitude and the great biodiversity are the factors determining the variety of beekeeping grazing in the region of Ruse in terms of quantity and quality. The analysis revealed that it is more professionally oriented and managed by the national, with more efficient territorial organization and development, and with a higher relative share of organic beekeeping. These advantages determine its higher competitiveness. Now the district of Ruse forms more than 10% of the national production of honey (over 1000 tons per year), respectively and in proportion to the economic effect of pollination - over BGN 100 million / year. The district offers very good opportunities and optimal conditions for the development of api-tourism, which will diversify the beekeeping farms and provide them with more stable and higher incomes. It has significant production, educational and innovative potential, a solid base for the formation of a regional beekeeping cluster.

Keywords: geographic and regionalization, administrative structure, cluster.

BIOPESTICIDI KAO EKOLOŠKI PRISTUP KONTROLI ŠTETNIH ORGANIZAMA U ORGANSKOJ POLJOPRIVREDI

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Organska poljoprivreda sve više dobija na značaju, samim tim i pitanja i problemi koji je prate. Jedno od ključnih pitanja organske proizvodnje jeste kako sačuvati i povećati prinose u uslovima ekspanzije bolesti, štetočina i korova ekstremno otpornih na biotičke i abiotičke faktore. Organska proizvodnja hrane i biološka kontrola štetnih organizama predstavljaju dve veoma pespektivne oblasti istraživanja u poljoprivrednoj proizvodnji. Imaju isti konceptualni okvir, počivaju na ekološkim osnovama i raznolikosti biodiverziteta i čine osnovu održive poljoprivrede. Površine pod organskom proizvodnjom zahvataju svega 1,5 % globalnih poljoprivrednih površina, dok biološki preparati čine samo oko 5% globalnog tržišta pesticida, što će reći da postoji ogroman potencijal za razvoj obe oblasti u budućnosti. Cilj rada je da ukaže na kompatibilnost i značaj primene bioloških mera borbe u sistemu organske poljoprivrede, radi povećanja sigurnosti i obima proizvodnje.

Ključne reči: organska poljoprivreda, biološka kontrola, zaštita životne sredine.

BIOPESTICIDES AS ECOFRIENDLY APPROACH FOR PEST CONTROL IN ORGANIC FARMING

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Organic agriculture becomes more and more significant, and therefore the accompanying problems and issues. One of the key issues of the organic production is how to protect and increase yields in conditions of diseases, pests and weeds expansion, extremely resistant to biotic and abiotic factors. The organic food production and biological control of harmful organisms represent two very perspective research fields in agricultural production. They have the same conceptual frame, basis on ecological grounds and variety of biodiversity and make a base of sustainable agriculture. Total areas under the organic production were 1.5% of global agricultural areas, while biological preparations made only around 5% of pesticides global market, which further shown great potential for development of both these areas in the future. This paper's goal is to point out to compatibility and significance of biological measures protection application in the organic agriculture system, in order to increase safety and size of production.

Keywords: organic agriculture, biological control, environmental protection.

REZIDUI PESTICIDA U ORGANSKOM MLEKU

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S porastom tržišta organske hrane, prevare u vezi kvaliteta organske hrane postale su problem za potrošače, proizvođače i tržište. Savremena proizvodnja prehrambenih proizvoda je gotovo u potpunosti zavisna od upotrebe pesticida. Na tržištu postoji oko hiljadu različitih pesticida koji imaju različite primene. Međutim, u proizvodnji organske hrana postoje stroge smernice šta se može koristiti tokom poljoprivrednog procesa i nije dozvoljena primena sintetičkih pesticida. Organska hrana sve više privlači potrošače, jer se smatra zdravijom od hrane proizvedene konvencionalnom poljoprivredom i održivom za životnu sredinu. Ovaj rad daje pregled kvaliteta proizvodnje organskog mleka u smislu prisustva ostataka pesticida. Metoda za određivanje količine pesticida u tragovima razvijena je ekstrakcijom na čvrstoj fazi i gasnom hromatografijom-masenom spektrometrijom. Rezultati su pokazali da su proizvodi organskog mleka u skladu sa relevantnim zakonodavstvom i da ne sadrže ostatke pesticida koji se mogu detektovati. Samo u jednom uzorku nivo ostataka heptahlor epoksida i imazalila je bio iznad maksimalne dozvoljene granice. Rezultati ovog rada pokazuju potrebu za uspostavljanjem programa praćenja rezidua pesticida za analizu mleka za ljudsku upotrebu radi poboljšanja sigurnosti hrane i smanjenja rizika od izlaganja potrošača.

Ključne reči: organsko mleko, organska proizvodnja, ekstrakcija, rezidui pesticida

PESTICIDE RESIDUES IN ORGANIC MILK

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With the organic food market on the rise, organic food fraud has become an issue to consumers, producers and the market. Modern food production almost entirely dependents on the use of pesticides. There are about a thousand different pesticides on the market that have different applications. Organic food however has strict guidelines on what can be used during the farming process and no synthetic pesticides are allowed to be applied in organic production. Organic food is increasingly attracting the interest of consumers, as it is perceived to be healthier than food produced by conventional agriculture, and to be more sustainable for the environment. This paper provides a review on the quality of organic milk produce in terms of the presence of pesticide residues. A method for the determination of trace amounts of the pesticides was developed using solid-phase extraction and gas chromatography-mass spectrometry. The results showed that the organic milk products were in conformity with the relevant legislation and did not contain detectable pesticide residues. Only in one sample the residue level of heptachlor epoxide and imazalil were above the Maximum Residue Limit. The results of this paper demonstrate the need to establish pesticide residue monitoring programs for milk analysis for human consumption to improve food safety and decrease exposure risks to consumers.

Keywords: organic milk, organic production, extraction, pesticide residues

САВРЕМЕНЕ КЛАНИЦЕ - УСЛОВ ЗА ХИГИЈЕНСКИ ИСПРАВНО МЕСО КОЗА

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У Србији се козје месо, а нарочито месо јаради, све више конзумира због карактеристичног укуса и пожељног хемијског састава.
Козје месо има отприлике исту хранљиву вредност као и овчије (ближе речено беланчевина више, а масти мање у односу на овчије месо). Поједини аутори сматрају да се због молекуларне структуре козје месо лакше вари.
Због ниске заступљености засићених масних киселина и холестерола, козје месо у исхрани људи, према појединим ауторима је здравија алтернатива у поређењу са другим врстама црвеног меса. Полинезасићене масне киселине преовлађују у месу коза, а исхрана богата са незасићеним масним киселинама је у корелацији са смањеним ризиком од можданог удара и коронарним болестима. Поред тога, у месу коза заступљене су есенцијалне амино киселине као што су лизин, треонин и триптофан.
Без обзира на нутритивну вредност, оно је ипак мање цењено због специфичног мириса и укуса који се осећају, тим више уколико је животиња старија.
Гајење коза и конзумација меса и поред наведеног квалитативног састава, условљени су и религијом, традицијом и обичајима али и тржиштем и навикама потрошача.
Хигијенски исправно месо коза се добија клањем коза у објектима у којима се, уз уважавање начела хигијене и технологије и под ветеринарско-санитарном контролом, кољу животиње и производи месо. Савремене кланице у којима се кољу козе морају бити изграђене, уређене и опремљене тако да је у њима могуће правилно извођење технолошких операција у току процеса клања и обраде трупова, одржавање личне хигијене радника, спровођење свих ветеринарско-санитарних мера и обављање ветеринарског прегледа животиња пре клања, меса и органа, а све у циљу добијања хигијенски исправног и квалитетног меса.
Поступак клања и кланичне обраде трупа битно могу утицати на здравствену исправност меса и производа од меса. Поред тога, (не)хумано поступање са животињама пре клања утиче на изазивање стреса а самим тим утиче и на квалитет меса. У погледу осигуравања здравствене исправности меса, а и хуманог поступања са животињама, велико значење имају и хигијенско-технички услови у кланицама, односно уређење објекта, околине, прилазних путева, истоварних рампи, сточних депоа, простора за привођење клању, простора за омамљивање, искрварење и кланичну обраду, као и опрема која се користи у објекту (Правилник о условима које морају да испуњавају објекти за клање животиња, обраду, прераду и ускладиштење производа животињског порекла "Сл. лист СФРЈ", бр. 53/89).

Кључне речи: месо, козе, клање, савремене кланице, хигијенска исправност.

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CONTEMPORARY SLAUGHTERHOUSES - A REQUIREMENT FOR THE HYGIENE CORRECT MEAT OF GOAT

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In Serbia, goat meat, and especially goat meat, is increasingly consumed because of its characteristic taste and desirable chemical composition.
Goat meat has about the same nutritional value as mutton (more protein is higher and fat is less in fat than mutton). Some authors believe that the molecular structure of goat meat is easier to digest.
Due to the low content of saturated fatty acids and cholesterol, goat meat is a healthier alternative, according to some authors, compared to other types of red meat. Polyunsaturated fatty acids are prevalent in goat meat, and a diet rich in unsaturated fatty acids is correlated with a reduced risk of stroke and coronary disease. In addition, essential amino acids such as lysine, threonine and tryptophan are represented in goat meat.
Regardless of its nutritional value, it is still less appreciated for its specific smell and taste, especially if the animal is older.
The breeding of goats and the consumption of meat, in addition to the above qualitative composition, are conditioned by religion, tradition and customs, but also by the market and habits of consumers.
Hygienically sound goat meat is obtained by slaughtering goats in establishments where, with due regard for the principles of hygiene and technology and under veterinary-sanitary control, animals are slaughtered and produced. Modern slaughterhouses in which goats are slaughtered must be built, arranged and equipped so that they can properly perform technological operations during the slaughtering and processing of carcasses, maintain personal hygiene of workers, carry out all veterinary and sanitary measures and carry out veterinary inspection of animals before slaughter , meat and organs, all with the aim of obtaining hygienically correct and quality meat.
The slaughtering and slaughtering operations of carcasses can significantly affect the health of meat and meat products. In addition, the (un) humane treatment of animals prior to slaughtering has the effect of causing stress and thus affecting meat quality. In terms of ensuring the health of meat, as well as the humane treatment of animals, hygienic and technical conditions in slaughterhouses are of great importance, that is, the arrangement of the facility, the environment, access roads, unloading ramps, livestock depots, places for slaughter, stunning, bleeding and slaughterhouse processing as well as equipment used in the establishment (Rulebook on the conditions to be fulfilled by facilities for slaughtering animals, processing, processing and storage of products of animal origin "Official Gazette of the SFRY", No. 53/89).

Keywords: meat, goats, slaughter, modern slaughterhouses, hygienic safety

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INSEKTI KAO ODRŽIVI IZVOR PROTEINA U HRANI I HRANI ZA ŽIVOTINJE

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Predviđa se da će se svetska populacija značajno povećati tokom narednih decenija, tako da će do 2050. godine na planeti živeti devet milijardi ljudi. Ograničena raspoloživost prirodnih resursa, stalne klimatske promene, hrana - hrana za životinje - gorivo konkurencija, stalna nestabilnost u sukobljenim regionima i ekonomska usporavanja u mirnijim delovima sveta okolnosti su koje doprinose pogoršanju pitanja sigurnosti hrane. Obezbeđivanje hrane i vode za sve, uz postizanje održivog ruralnog razvoja, zavisi od odgovornog upravljanja prirodnim resursima, a samim tim i od potpuno održivog poljoprivrednog sistema, što zahteva dobro osmišljene strategije. Ispitivanjem različitih rešenja insekti kao nova hrana i hrana za životinje postaju široko prihvaćeni i stavljeni u fokus različitih interesnih grupa, kao odgovor na rastuće potrebe za proteinskim izvorima za životinje i ljude.

Insekti su uobičajena hrana mnogih vodozemaca, gmizavaca, ptica i sisara, zbog čega su njihove uloge u lancima hrane nezamenljive. Oni takođe čine deo tradicionalne ishrane najmanje 2 milijarde ljudi, a više od 1900 vrsta se pominje u tom kontekstu. U Evropi se ovo pitanje sve više aktuelizuje. Evropska komisija je 2017. godine usvojila Uredbu EU br. 2017/893 kojom se omogućuje uzgoj sedam vrsta insekata i korišćenje u ishrani akvakulture. Ovaj spisak obuhvata: crnu vojničku muvu (*Hermetia illucens*), običnu domaću muvu (*Musca domestica*), velikog brašnara (*Tenebrio molitor*), manjeg brašnara (*Alphitobius diaperinus*), domaćeg kućnog cvrčka (*Acheta domesticus*), tropskog kućnog cvrčka (*Grillodes sigillatus*) i poljskog cvrčkg (*Grillus assimilis*). Počev od 2018. godine, na snagu je stupila Uredba (EU) br. 2015/2283 kojom su utvrđene odredbe za odobravanje nove hrane u Evropi, gde su insekti prvi put izričito pomenuti.

Zbog visokog sadržaja proteina, dobro izbalansiranog sastava aminokiselina i ostalih hranljivih materija koje sadrže, insekti se smatraju vrednim sastojcima hrane za životinje i atraktivnom alternativom tradicionalnim namirnicama životinjskog porekla za ljudsku ishranu, kao što su mleko, meso, riba i jaja. Generalno, primena insekata u hrani i hrani za životinje povoljnija je po životnu sredinu od tradicionalnih izvora proteina. Oni se mogu uzgajati na organskim ostacima (uključujući ljudski i životinjski otpad) i emituju manje gasova sa efektom staklene bašte i manje amonijaka od goveda ili svinja. Takođe im je potrebno znatno manje zemljišta i vode u odnosu na domaće životinje. Ključni faktor uspešnog usvajanja insekata kao izvora proteina u hrani je prihvatanje od strane potrošača, što je određeno raznolikošću ličnih stavova i interesovanja. Pozitivnu odluku takođe treba da obezbedi rešavanje nekih otvorenih pitanja: temeljna procena rizika, regulatorni aspekti, ispravno deklarisanje i odgovarajuća laboratorijska kontrola.

Ključne reči: ishrana životinja i ljudi, svetsko snabdevanje proteinima.

INSECTS AS SUSTAINABLE FOOD AND FEED PROTEIN SOURCE

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The world population is projected to increase considerably over the coming decades, so there will be nine billion people by 2050. Limited availability of natural resources, ongoing climatic changes, food-feed-fuel competition, persistent instability in conflict-ridden regions and economic slowdowns in more peaceful countries all worsened the food security. Ensuring adequate food and water for all, while achieving sustainable rural development, depends on responsible management of natural resources, and therefore on a fully sustainable agriculture system. Such situation requires well designed strategies. By searching for different possible solutions, insects as novel feed and foodstuffs have become widely accepted and centered in the focus of different stakeholders, as the answer to the growing demands for the production of protein sources for animals and humans.

Insects are commonly eaten by many amphibians, reptiles, birds and mammals, making their roles in food chains irreplaceable. They also form part of the traditional diets of at least 2 billion people and more than 1 900 species have reportedly been used as food. In Europe, this issue is more actualized. In 2017 the European Commission adopted the EU Regulation No. 2017/893 allowing seven species to be reared and used in feeding aquaculture. This closed list of authorized insects included: black soldier fly (*Hermetia illucens*), common housefly (*Musca domestica*), yellow mealworm (*Tenebrio molitor*), lesser mealworm (*Alphitobius diaperinus*), house cricket (*Acheta domesticus*), banded cricket (*Gryllodes sigillatus*) and field cricket (*Gryllus assimilis*). Starting in 2018, Regulation (EU) No. 2015/2283 entered into force, laying down provisions for the approval of novel foods in Europe, where insects were explicitly mentioned for the first time.

Due to the high protein content, well balanced amino acid composition and the other nutrients they contain, insects are considered as valuable sources for animal feed and an attractive alternative to traditional foods of animal origin, such as milk, meat, fish and eggs in human nutrition. In general, the application of insects for food and feed purposes is environmentally more beneficial than traditional sources of proteins. They can be reared on organic side-streams (including human and animal waste) and are reported to emit fewer greenhouse gases and less ammonia than cattle or pigs. They also require significantly less land and water than cattle rearing. The key factor to the successful adoption of insects as a source of protein for feed and food is consumer acceptance, which is determined by a diversity of personal attitudes and interests. The positive decision should also be supported by the resolution of some outstanding issues: thorough risk assessment, regulatory aspects, correct labeling and suitable laboratory control.

Keywords: animal and human nutrition, world protein supply.

TURIZAM SRBIJE U USLOVIMA EPIDEMIJE: PARKOVI PRIRODE I NACIONALNI PARKOVI KAO POTENCIJALNE DESTINACIJE

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Prva polovina 2020. godine donela je pandemiju virusa Covid-19, što je rezultiralo ekonomskim i privrednim promenama na svetskom nivou. Svakako da je naveći potres obuhvatio ljjudske živote, budući da su brojevi zaraženih poražavajući, a preminulih još više. Dodatnu nesigurnost upravo izazivaju ekonomska nestabilnost i urušena privreda. Očekivano je da će se u takvim uslovima turizam naći na možda i najvećem udaru krize, kada govorimo o privredi. U situaciji kada se čovečanstvo bori za opstanak, putovanja definitivno nisu prioritet. Upravo zbog toga je sprovedeno istraživanje koje se tiče turističkih uslova u doba epidemije u Republici Srbiji. Istaživanje je obavljeno na uzorku od 100 ispitanika iz različitih gradova Srbije, telefonskim putem, pri čemu je korišćena kombinovana anketa (5 pitanja sa ponuđenim odgovorima i 5 deskriptivnih pitanja). Valjalo je najpre utvrditi kakvi su stavovi građana Srbije povodom odmora u ovako otežanim uslovima i da li uopšte razmatraju putovanje u inostranstvo. Opcija putovanja po Srbiji nametnuta je dobrim podsticajnim merama Republike Srbije, koje uključuju vaučere za plaćanje smeštaja na različitim destinacijama u zemlji. Ovakava mera ojačavanja domaćeg turizma jeste dobra, ali, kako se ispostavlja se iz istraživanja, nije dovoljna. Svest o ogromnom turističkom potencijalu naše zemlje još uvek nije na zavidnom nivou i ono što se nameće kao opcija domaćim turistima – parkovi prirode i naiconalni parkovi – još uvek su dobrim delom neprilagođeni turističkim zahtevima 21. veka. Ovo istraživanje ima cilj da pokaže kakvi se to problemi javljaju i koje su to slabe tačke na kojima valja raditi kako bi se turizam Srbije, koja ima ogroman potencijal, ojačao.

Ključne reči: Covid-19, turizam, parkovi prirode, turistički potencijal

SERBIAN TOURISM IN THE CONDITIONS OF THE EPIDEMIC: NATURE PARKS AND NATIONAL PARKS AS POTENTIAL DESTINATIONS

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The first half of the year 2020 brought a pandemic of the Covid-19 virus, which resulted in economic changes at the global level. Certainly, the biggest changes affected people's lives, since the numbers of those infected are devastating, and the number of deaths is even higher. Additional uncertainty is caused by economic instability. It is expected that in such conditions tourism will find itself in perhaps the biggest crisis. When humanity is struggling to survive, travelling is definitely not a priority. That is exactly why this research observes tourist conditions during the epidemic in the Republic of Serbia. The survey was conducted on a sample of 100 respondents from different cities in Serbia, by telephone, using a combined survey (5 questions with offered answers and 5 descriptive questions). It was first necessary to determine the attitudes of the citizens of Serbia regarding vacations in such difficult conditions and whether they are considering traveling abroad at all. The option of traveling in Serbia is imposed by good incentive measures of the Republic of Serbia, which include vouchers for payment of accommodation at various destinations in the country. This measure of strengthening domestic tourism is important, but it will turn out from the research, it is not enough. Awareness of the huge tourist potential of our country is still not at a high level and what is imposed as an option to domestic tourists - nature parks and national parks - are still largely unsatisfactory for the tourist requirements of the 21st century. However, this kind of research aims to show what problems arise and what are the weak points that need to be worked on in order to strengthen the tourism of Serbia, which has a huge potential.

Keywords: Covid-19, tourism, nature parks, tourist potential.

ZELENA EKONOMIJA I EKOTURIZAM

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Apstrakt: Koncept zelene ekonomije je relativno novi koncept koji je uveden s ciljem da se prevaziđu nedostaci prethodnih modela razvoja, pre svega, zapostavljanje pitanja zaštite životne sredine. Održivi razvoj teži uspostavljanju ravnoteže između različitih dimenzija razvoja: ekonomske, ekološke i socijalne. Turizam je jedan od najvažnijih pokretača razvoja svetske privrede pa se pred njega postavlja zadatak uspostavljanja održivog i odgovornog razvoja u cilju očuvanja svih bitnih vrednosti okruženja. Ubrzan razvoj ekoturizma u svetu podrazumeva i novo ponašanje učesnika u turističkim kretanjima uz duhovno obogaćenje ličnosti, i svrsishodan odnos prema prirodnim i antropogenim turističkim vrednostima. Suprastruktura u ekoturizmu se rapidno razvija u skladu sa savremenim trendovima i nudi turistima, širom sveta, različite vidove ekoloških turističkih proizvoda. Usvajanje koncepta zelene ekonomije i upravljanje ekoturizmom, uz korišćenje iskustava drugih zemalja, može doprineti odgovarajućem pozicioniranju Srbije kao ekoturističke destinacije na međunarodnom turističkom tržištu.

Ključne reči: zelena ekonomija, ekoturizam, turistički razvoj, ekoturistička destinacija.

GREEN ECONOMY AND ECOTOURISM

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The concept of green economy is a relatively new concept that has been introduced in order to overcome the shortcomings of previous models of development, above all, neglect of environmental issues. Sustainable development seeks to establish a balance between the various dimensions of development: economic, environmental and social. Tourism is one of the most important drivers of the world economy, however, it has to manage the task of establishing a sustainable and responsible development in order to preserve all the important values of the environment. The rapid development of ecotourism in the world means a new behavior of the participants in the tourism developments through spiritual enrichment of personality, with a meaningful relationship to the natural and anthropogenic tourist values. Suprastructures in ecotourism is rapidly evolving in line with modern trends and offers tourists all over the world, various forms of eco-tourism products. The adoption of the concept of green economy and management of ecotourism, using the experience of other countries, can contribute to the proper positioning of Serbia as ecotourism destinations in the international tourism market.

Keywords: green economy, ecotourism, tourism development, ecotourism destination.

EKO TURIZAM KAO RAZVOJNA ŠANSA SEVERA KOSOVA I METOHIJE SA AKCENTOM NA OPŠTINU ZUBIN POTOK

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Problem društvenog, socijalnog, političkog i privrednog razvoja opština na području severa Kosova i Metohije traje dugi niz godina, posebno posle ratnih dejstava i NATO bombardovanja 1999. godine. Usled društvene devastacije, razorenih ekonomskih i infrstrukturnih objekata, nedostatka u vodosnabdevanju i napajanja električnom energijom, nastaje veliki problem u životu stanovništva a posebno u obnovi i pokretanju privrednih aktivnosti. Takođe, politička kriza i slaba vladavina prava, kriminal i korupcija na visokom nivou, dugoročno negativno utiču na pokretanje privredne aktivnosti, jer u pomenutim okolnostima mala je ili skoro nikakva verovatnoća dolaska stranih direktnih investitora. Osim sporadičnih preduzetničkih poduhvata lokalnih preduzetnika pre svega u trgovinskim i ugostiteljskim delatnostima drugih razvojnih poduhvata gotovo i da nema. Kao jedno od rešenja u podsticanju ekonomske aktivnosti i zapošljavanja lokalnog stanovništva je u korišćenju prirodnih resursa koje se nalaze na području pomenutih opština. Visok potencijal za razvoj turizma, pre svega, eko turizma ima opština Zubin Potok na kojoj se nalazi veštačko jezero Gazivode kao i planina Mokra Gora čiji je najveći vrh 1740 metara nadmorske visine koju je još naš čuveni naučnik Jovan Cvijić proglasio za Balkansku lepoticu. Specifičnost i prednost ove opštine je što sa na ovako malom prostoru nalaze ovakvi prirodni potencijali koji mogu da se iskoriste za razvoj ekoturizma.

Danas postoji opšta saglasnost oko toga da ekoturizam predstavlja najbolji način za pomoć lokalnom stanovništvu. Ekoturizam predstavlja idealnu komponentu strategije održivog razvoja, gde prirodni resursi mogu biti iskorišćeni kao turističke atrakcije, bez nanošenja štete turističkim područjima. Takođe i program UN za životnu sredinu „održivi turizam“ podrazumeva razvoj ove delatnosti uvažavajući i zadovoljavajući potrebe turista kao nosioca tražnje, i turističkih oblasti kao nosioca ponude, ali uvažavajući ekološke, društvene i ekonomske ciljeve kako bi se koristili i u budućnosti. Prema tome, koncept održivog razvoja treba da bude ključna determinanta prilikom planiranja i organizacije turističkih delatnosti kako bi se istovremeno ostvarili ekonomski i društveni ciljevi ali i zaštitile kulturne vrednosti, socijalni integritet, ekološki procesi i biološki diverzitet. Uz poštovanje principa održivog razvoja glavni cilj ekoturizma na području opštine Zubin Potok je da se turistima omogući uživanje u prirodnim resursima, sticanje znanja o prirodnim, istorijskim i kulturnim znamenitostima ovog područja uz istovremeno podsticanje ekonomskog razvoja kroz uključivanje lokalne zajednice.

U radu će biti predstavljeni prirodni resursi opština na Severu Kosova pre svega, opštine Zubin Potok, analiza dostupnih sadrzaja i mogućnosti razvoja ekoturizma, a biće dati i predlozi za poboljšanje postojećih i kreiranje novih sadrzaja u cilju ekonomske dobrobiti za lokalno stanovništvo, uz primenu principa održivog razvoja.

Ključne reči: ekoturizam, održivi razvoj, lokalni razvoj, Zubin Potok.

ECO TOURISM AS A DEVELOPMENT CHANCE OF THE NORTH OF KOSOVO AND METOHIJA WITH AN ACCENT ON THE MUNICIPALITY OF ZUBIN POTOK

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The problem of social, political and economic development of municipalities in the northern of Kosovo and Metohija, has been going on for many years, especially after the 1999 war and military attacks by NATO intervention. Due to social devastation, destroyed economic and infrastructure facilities, lack of water and electric supplies, a major problem arises in the life of population with special focus on renewal and initiation of economic activities. Also, the political crisis, weak rule of law, crime and corruption on high level, in long-term aspect adversely affect the start-up of economic activities, because, in the mentioned of circumstances there is a little or none of likelihood for coming of direct foreign investments. Apart from sporadic entrepreneurial ventures primarily in trade and catering activities, other developmental ventures almost none. As one of the solutions, in stimulating process of economic activity and employment of local population is to use natural resources located in the mentioned municipalities. High potential for development of tourism, primarily in eco-tourism has municipality of Zubin Potok, where is located artificial lake Gazivode as well as mountain of Mokra Gora with the highest peak of 1740 meters above sea level, declared as a Balkan beauty by our famous scientist Jovan Cvijic. The specificity and advantage of this municipality is that in such a small area they have such natural potentials that can be used for the development of eco-tourism.

Today, there is a general acceptance that eco-tourism represents the best way to develop local population. Eco-tourism is an ideal component of strategy for sustainable development, where natural resources can be used as tourist attractions, without causing damage to tourist areas. Also, UN program for environment “Sustainable tourism” implies development of such activity while respecting and meeting the needs of tourists as demand holders, and touristic areas as supply holders, but also respecting ecological, social and economic aims in order to use them for future. Therefore, concept of sustainable development should be a key determinant during in the pursuit of tourism activities in order to achieve both economic and social goals while protecting cultural values, social integrity, key ecological processes and biological diversity. Respecting the principles of sustainable development, the main aim of eco-tourism in Zubin Potok municipality is opportunity that tourist can gain the knowledge about natural, historical and cultural attraction of this area, as well as to stimulate economic development through involvement of local society.

By this paper, will be presented available natural resources of municipalities in northern Kosovo, especially resources of Zubin Potok municipality in regards to development process of eco-tourism as well as suggestion for improving existing and creating new content with the aim of economic well-being for the local population, but also applying the principle of sustainable development.

Keywords: ecotourism, sustainable development, local development, Zubin Potok.

RURALNI TURIZAM U FUNKCIJI ZELENE EKONOMIJE

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Ciljevi u planiranju zelene ekonomije u Srbiji moraju biti fokusirani na ekonomski rast i razvoj uz poštovanje ekoloških kriterijuma i kapaciteta lokalne sredine, poboljšanje kvaliteta življenja i zaštitu ekoloških resursa. Ekonomski procesi održivog razvoja odnose se na ujednačeni razvoj po svim ekonomskim, socijalnim, kulturnim, pravnim, političkim, ali i ekološkim pitanjima. Ako se nastavi dosadašnji trend neefikasnosti proizvodnih faktora i neefikasno korišćenje prirodnih resursa u budućnosti se mogu očekivati ekološki nepovoljni uticaji, pa i stvaranje uslova za katastrofalne pojave. U ovom radu analizira se mogućnost stvaranja integrisane ponude u selima sa ruralnim turizmom i uticajem na privredni razvoj i sprečavanje katastrofalnih pojava. U radu će biti date i preporuke za unapređenje ekonomskog ambijenta u Republici Srbiji kroz održivi razvoj sela i razvoj ruralnog turizma na principima održivosti.

Zelena ekonomija sela u osnovi zavisi od praktične primene kombinacije koncepta multifunkcionalne poljoprivrede i razvoja drugih ekonomskih aktivnosti u skladu sa raspoloživim prirodnim i ljudskim resursima, u cilju sveukupnog poboljšanja uslova života, kao i socioekonomskog položaja sela i seoskih zajednica. Poslednjih godina i u Srbiji raste svest o neophodnosti da se i poljoprivreda, kao sektor, i ruralne oblasti, kao specifični prostor na kome se ona odvija moraju tretirati integralno, sa svim komponentama koje ga čine. (Đorđević, S., et all., 2012)

Republika Srbija je bogata resursima za razvoj ruralnog turizma na principima zelene ekonomije. Ruralna područja poseduju visokokvalitetne prirodne resurse, bogato kulturno i istorijsko nasleđe, tradiciju i sve elemente koji su neophodni za stvaranje integrisane ponude u selima. Međutim, razvoj ruralnog turizma je prilično neorganizovan i karakteriše ga nedostatak podrške javnog sektora u pravnom, finansijskom i institucionalnom smislu. Tržište ruralnog turizma se neprekidno menja, boravci turista postaju sve kraći, povećava se svest i odgovornost za sopstveno zdravlje, zahtevi za aktivnim odmorom, a povećava se i svest o standardima kvaliteta, pa i sa ciljem zaštite životne sredine od katastrofalnih pojava.

Ključne reči: zelena ekonomija, ruralni turizam, održivi razvoj.

RURAL TOURISM IN FUNCTION OF A GREEN ECONOMY

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The goals in planning green economy in Serbia must pay attention to economic growth and development, with respect to ecological criteria and capacities of local environment, improving the quality of life and protection of natural resources. Economical processes of sustainable development of the rural tourism, relate to the tendency toward balanced development in economic, social, cultural, legal, political and environmental issues. If the current trend of inefficiency of production factors and inefficient utilization of natural resources continues, ecologically unfavorable effects can be expected, as well as emergence of catastrophic phenomena. This paper analyzes the possibility of creating an integrated offer of villages with rural tourism with their influence on economic development and also related to the environment, with prevention of emergence of catastrophic phenomena. This paper also contains recommendations for improvement of economic environment in the Republic of Serbia trough sustainable development of villages and rural tourism in them.
Green economy of the village basically depends on the practical application of the combination of the concept of multifunctional agriculture and the development of other economic activities in accordance with the available natural and human resources, the overall improvement of the living conditions, as well as the socioeconomic position of villages and rural communities. In recent years in Serbia, there is a growing awareness about the necessity that the agriculture, as a sector, and rural communities, as a specific space on which it is taking place, must be treated integrally within all the components that make them as a whole. (Đorđević, S., et all., 2012)
The Republic of Serbia has plenty of resources for development of rural tourism on principles of green economy. Rural communities have high quality natural resources, rich cultural and historical heritage, traditions, events, and all the elements that are essential for the creation of an integrated offer in the villages. However, the development of rural tourism is quite disorganized and characterized by lack of support from the public sector in the legal, financial and institutional sense. The rural tourism market is constantly changing, tourist stays are becoming shorter, their conscience and responsibility for their own health are growing, as well as the need for active holiday and awareness of standards in every way, even when it comes to protection of the environment from catastrophic phenomena.

Keywords: green economy, rural tourism, sustainable development.

EKONOMSKI I FINANSIJSKI ASPEKTI RAZVOJA EKOLOŠKE TURISTIČKE PRIVREDE U SRBIJI

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Internacionalizacija turističke privrede doprinela je da se država pojavi kao moderni subjekt usmeravanja i koordinacije razvoja turizma. Država u tom smislu, podsticajnim poreskim merama može doprineti razvoju turističke privrede obzirom da turizam učestvuje u jako malom procentu u finansiranju društvenog proizvoda i udelom u ukupnoj zaposlenosti. U razvoju turističke privrede savremena država može da putem selektivne i podsticajne poreske politike posebnu paznju usmeriti na posebne programe ekološke turisticke privrede. U tom kontekstu, novi potencijal Srbija može tražiti u regionalizaciji turističke destinacije i građenju poreskih kapaciteta regiona aktivnom fiskalnom politikom vodeći se iskustvima Evrope i evropskim merama. Istraživanjem i funkcionalnom analizom dometa fiskalne politike Srbije dolazimo do rezultata u kojoj meri i na koji način Srbija može anticipirati i usmeravati razvoj turizma u održivom i inkluzivnom kontekstu kao okosnicu ekonomskog razvoja celokupne privrede

Ključne reči: turistička privreda, fiskalni stimulansi, razvoj.

ECONOMIC AND FINANCIAL ASPECTS OF THE DEVELOPMENT OF ECOLOGICAL TOURIST INDUSTRY IN SERBIA

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The internationalization of tourism production and the monetarization of market tourist transactions contributed to the state emerging as a modern entity of directing and coordinating the development of tourism. A state in this sense, incentive tax measures can contribute to the development of the tourism industry as tourism participates in a very small percentage in the financing of the social product and share in the total employment. In the restructuring of the tourist economy of the savvy, the state can, through the selective and stimulating tax policy, treat innovation as an integral part of the development programs. In this context, Serbia can seek new potential in the regionalization of the tourist destination and building the tax capacity of the region by active fiscal policy, guided by the experiences of Europe and European measures. By researching and functional analysis of the extent of Serbia's fiscal policy, we come to the extent to which Serbia can anticipate and direct the development of tourism in a sustainable and inclusive context as the backbone of the economic development of the entire economy.

Keyword: tourist industry, fiscal stimuli, development.

ODRŽIVI RAZVOJ TURIZMA SRBIJE U CILJU PODIZANJA EKOLOŠKE SVESTI - STUDIJA SLUČAJA GRADA BEOGRADA

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Cilj rada je da ukaže na značaj održivog razvoja turizma Srbije. Da bi prevazišli nedostatke održivog turističkog razvoja autori predstavljaju turističke privlačnosti i prednosti Srbije i grada Beograda, centralnog regiona, koje bi mogle da imaju pozitivan uticaj na priliv turista i imidž turističke destinacije.
Predmet rada je razmatranje zaštite životne sredine, ublažavanje negativnih uticaja iz okruženja na turizam koji ima važnu ulogu u održivom ekološko-ekonomskom razvoju i zelenom rastu gradova i zemlje. Autori su primenili odgovarajuću metodološku analizu grada Beograda, koji spada u najrazvijeniji turistički region zemlje.
PEST(E) analiza opisuje političke, pravne, socio-kulturne, ekonomske, tehnološke i ekološke elemente grada Beograda kako bi se identifikovali faktori koji utiču na održivi razvoj i ekološku svest. Investiranje održivog turizma podrazumeva finansijska ulaganja u ekološku infrastrukturu na regionalnom i lokalnom nivou, investicije za formiranje ekološkog geografskog informacionog sistema i promotivne menadžment aktivnosti za poboljšanje rejtinga konkurentske prednosti održivog turističkog razvoja grada Beograda i Srbije.

Ključne reči: Održivi razvoj turizma, Centralni region Srbije, Grad Beograd, PESTE analiza.

SUSTAINABLE TOURISM DEVELOPMENT OF SERBIA WITH THE AIM OF RAISING ENVIRONMENTAL AWARENESS - CASE STUDY CITY OF BELGRADE

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The paper aims to point the importance of sustainable tourism development at local and indirectly at the regional and national level of Serbia. To overcome disadvantages of sustainable tourism development, the authors present some of the attractiveness of the Serbian central region, that could have a positive influence on the tourist visiting of this destination.
Serbia is a country characterized by uneven regional development. The authors applied the regional analysis of the central region of Serbia, i.e. the analysis of the city of Belgrade, which belongs to the most developed region of the country.
The PESTE analysis describes the political, legal, socio-cultural, economic, technological and environmental elements of the city of Belgrade, to identify factors that have an impact on sustainable development and environmental awareness.

Keywords: Sustainable tourism development, Serbian central region, Belgrade city, PESTE analysis.

EKOLOŠKA ODGOVORNOST TURISTIČKIH ORGANIZACIJA

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Povećanje broja turista uzrokuje potrebu za izgradnjom smeštajnih kapaciteta i širenjem turističke ponude. Turistička ponuda uglavnom se temelji na prirodnim lepotama samog lokaliteta. Očuvanje prirodnih lepota zadatak je države, ali i vlasnika hotela i pojedinaca, kako domaćeg stanovništva, tako i turista. Ovaj rad daje pregled zakonodavstva koje reguliše turizam. U radu se takođe razmatra važnost odnosa hotelijera sa životnom sredinom, kao i mogućnosti promocije kroz popularizaciju ekoturizma.

Ključne reči: ekoturizam, urbanizacija, održivi razvoj, zakonska regulativa.

ENVIRONMENTAL RESPONSIBILITY OF TOURISM ORGANIZATIONS

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The increase in the number of tourists causes the need to build accommodation capacities, and to complement the tourist offer. The tourist offer is mostly based on the natural beauty of the locality itself. Conservation of natural beauties is a task for both the state, hotel owners and individuals, both locals and tourists. This paper provides an overview of legislation regulating tourism. The paper also considers the importance of the hotelier's relation to the environment, as well as the possibilities of promotion through the popularization of ecotourism.

Key words: ecotourism, urbanization, sustainable development, law regulation.

DOPRINOS ZELENE EKONOMIJE RAZVOJU EKOTURIZMA I ORGANSKOJ PROIZVODNJI

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Razvoj ekoturizma i organske proizvodnje dovodi do primene ekoloških, socijalnih i ekonomskih principa održivog razvoja, što se ogleda u očuvanju životne sredine, unapređenju blagostanja ljudi i socijalnih jednakosti, ali i ostvarenju profita. Samim tim, primenom ovog koncepta ostvaruje se pozitivan povratni efekat ekoturizma i organske proizvodnje, koji se ogleda u primeni osnovnih principa i ostvarenju ciljeva održivog rasta i razvoja. Organska proizvodnja se smatra jednim od važnih pristupa poljoprivredi i proizvodnji hrane koji je ekološki održiv i može stvoriti nekoliko pozitivnih uticaja na ruralno društvo. Međutim, razvoj organske proizvodnje i dalje je ograničen u R. Srbiji, a glavni razlog je nedostatak ekonomskih podsticaja za poljoprivrednike.
Prelazak na organsku proizvodnju pruža više mogućnosti za zapošljavanje i bolje uslove rada. Ova dva elementa su relevantna za zemlje u razvoju. U stvari, može se primetiti da se u 21. veku očekuje da organska proizvodnja poboljša radne uslove i životni standard ekonomski zaostalih i osetljivih grupa dok će istovremeno će pružiti priliku za primenu održivog rasta i razvoja.
Zelena ekonomija predstavlja značajno sredstvo za ostvarenje osnovnih ciljeva održivog rasta i razvoja. Njena primena doprinosi očuvanju i zaštiti životne sredine, ali i dobrobiti ljudskog društva. Ona dovodi do ostvarenja održivog rasta i razvoja, koji uzima u obzir dobrobit kako sadašnjih, tako i budućih generacija. To je održiv koncept ekonomije u dugom roku, jer omogućava istovremeno ostvarenje ekonomskog rasta, očuvanje životne sredine i unapređenje životnog standarda ljudi. Za njenu uspešnu primenu je veoma važno zajedničko delovanje javnog i privatnog sektora, kako bi se obezbedio adekvatan ambijent za tranziciju ka zelenoj ekonomiji i povećanje investicija u proizvode, procese i usluge koji ne štete i ne ugrožavaju životnu sredinu.
U konceptu zelene ekonomije, pored zaštite životne sredine, mere zelene politike pružaju suštinske ekonomske koristi kroz sigurnost resursa, ekonomsku stabilnost i stvaranje zelenih radnih mesta. Inicijativa za zelenu ekonomiju osmišljena je da pomogne državama u „ozelenjavanju“ svojih ekonomija preoblikovanjem i preusmeravanjem politika, investicija i potrošnje u niz sektora, kao što su čiste tehnologije, obnovljivi izvori energije, usluge vodosnabdevanja, zeleni transport, upravljanje otpadom, zelene zgrade, održiva poljoprivreda i gazdovanje šumama.
Ne postoji nijedan drugi sektor koji se dotiče toliko važnih aspekata zelene ekonomije, kao što je gore definisano, ekoturizam i organska proizvodnja. I dalje predstavlja najvažniji izvor prihoda za većinu svetske populacije; proizvodi većinu potrebne hrane; koristi približno 40 procenata kopnene površine; pružajući niz ključnih usluga za potrebne savremenog društva. Stoga organska poljoprivreda igra ključnu ulogu u transformaciji društava u zelenu ekonomiju.
Ukratko, pod simbiotskim odnosom, organska poljoprivreda nije samo proizvodnja robe i pružanje usluga, ona može postati jedna važna uslužna ekonomija, pa čak i stvoriti ekonomiju iskustva u turističkoj industriji.

Ključne reči: zelena ekonomija, ekoturizam, organska proizvodnja, zaštita životne sredine, održivi razvoj

GREEN ECONOMY CONTRIBUTION TO THE DEVELOPMENT OF ECO-TOURISM AND ORGANIC PRODUCTION

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The development of ecotourism and organic production leads to the application of ecological, social and economic principles of sustainable development, which is reflected in the preservation of the environment, the improvement of human well-being and social equality, but also the realization of profits. Therefore, the application of this concept achieves a positive feedback effect of ecotourism and organic production, which is reflected in the application of basic principles and achieving the goals of sustainable growth and development. Organic production is considered one of the important approaches to agriculture and food production that is environmentally sustainable and can create several positive impacts on rural society. However, the development of organic production is still limited in the Republic of Serbia, and the main reason is the lack of economic incentives for farmers. The transition to organic production provides more employment opportunities and better working conditions. These two elements are relevant for developing countries. In fact, it can be observed that in the 21st century, organic production is expected to improve the working conditions and living standards of economically backward and vulnerable groups while at the same time providing an opportunity to implement sustainable growth and development. The green economy is an important tool for achieving the basic goals of sustainable growth and development. Its application contributes to the preservation and protection of the environment, but also to the well-being of human society. It leads to the achievement of sustainable growth and development, which takes into account the well-being of both present and future generations. It is a sustainable concept of the economy in the long run, because it enables the simultaneous realization of economic growth, preservation of the environment and improvement of people's living standards. For its successful implementation, the joint action of the public and private sectors is very important, in order to provide an adequate environment for the transition to a green economy and increase investment in products, processes and services that do not harm or endanger the environment. In the concept of the green economy, in addition to environmental protection, green policy measures provide substantial economic benefits through resource security, economic stability and the creation of green jobs. The Green Economy Initiative is designed to help countries "green" their economies by reshaping and redirecting policies, investments and spending into a range of sectors, such as clean technologies, renewable energy, water services, green transport, waste management, green buildings, sustainable agriculture and forest management. There is no other sector that touches on so many important aspects of the green economy, as defined above, ecotourism and organic production. It remains the most important source of income for the majority of the world's population; produces most of the food needed; uses approximately 40 percent of the land area; providing a range of key services for the needs of modern society.In short, under a symbiotic relationship, organic agriculture is not just the production of goods and the provision of services, it can become an important service economy, and even create an economy of experience in the tourism industry.

Keywords: green economy, ecotourism, organic production, environmental protection, sustainable development.

Sekcija 4

ULOGA BIOGEOHEMIJE U RAZVOJU BIOTEHNOLOGIJA

Section 4

THE ROLE OF BIOGEOCHEMISTRY IN THE DEVELOPMENT OF BIOTECHNOLOGIES

BIOGEOCHEMICAL TECHNOLOGY OF SOIL RECULTIVATION IN THE GAS INDUSTRY

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The present biogeochemical technology already used at large scales in the Taz peninsula (68°09' N, 76°02' E; The Yamalo-Nenets Autonomous District, Russia) as the area of functioning of "Gazprom Dobycha Yamburg" LLC. It is known that in the course of productive activity of this company mechanical impact on a soil-vegetable cover in case of journey of the equipment connected with prospecting, well drilling and arrangement of crafts isn't excluded. As a result, the integrity of tundra soils is disturbed as they partially or completely lose a vegetable cover and an organogenic layer, and the mineral underlying horizons come to a day surface. The purpose of this work consisted in presentation of the scheme of biogeochemical technology for recultivating disturbed soils. The biogeochemical technology for recultivation of disturbed soils consists from 3 basic stages including the list of consecutively carried out operations:
1) make of a large scale map-scheme of the area of functioning of "Gazprom Dobycha Yamburg" LLC with identification on its separate sites of the disturbed soils and measurement of their areas, and also with identification of the locations of peat deposits; from the indicated sites and peat deposits select, respectively, representative average samples of the soil and peat (0-6 cm layer) for definition of their full moisture capacity, for the purpose of the subsequent identification of a ratio of peat:soil, necessary for recultivation of the specific site;
2) as following from the identified ratio of a peat:soil count the mass of peat covering of 0-6 cm layer of the disturbed soil, and also mass of the itself disturbed soil in a layer of 0-6 cm for the area of the all recultivating site; the mass of peat is previously brought to a friable state by air drying that is necessary for convenience of its uniform distribution on all site area and further covering in a layer of the disturbed soil; covering of peat in 0-6 cm a layer of the disturbed soil and crops of seeds of perennial cereal grass mixture carry out by the principle of the device of lawns on big squares or the «regrassing» method, using appropriate technologies and the equipment; effective method of increase in stability the creating of phytocenosis at recultivating disturbed soils is inclusion of local plant types in indicated grass mixture;
3) for improvement of sowing properties of seeds, regulation of plant state at various stages of development and in the course of forming of their productivity, and also increase of plant resistance to adverse effects of the external environment apply the potassium humate preparation used in certain doses for processing of seeds before crops, processing and spraying of aboveground biomass during vegetation with use of appropriate technology and the equipment; a potassium humate preparation is received by the original method from local peats. In conclusion, it should be noted that this technology is protected by a number of patents of the Russian Federation on inventions.

Keywords: the Taz peninsula, gas industry, recultivation of disturbed soils biogeochemical technology, three basic stages.

РАЗРАБОТКА ЭКОЛОГИЧЕСКИ БЕЗОПАСНЫХ ПРИЕМОВ ОБОГАЩЕНИЯ СЕЛЬСКОХОЗЯЙСТВЕННЫХ КУЛЬТУР СЕЛЕНОМ И ЙОДОМ В УСЛОВИЯХ ЗАПАДНОЙ СИБИРИ

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Одной из актуальных экологических проблем является проблема микроэлементозов. Территории многих регионов мира недостаточно обеспечены селеном и йодом. Эффективным способом оптимизации селенового и йодного статуса является агрохимический – использование микроудобрений для ряда сельскохозяйственных культур в конкретных агроэкологических условиях. В то же время представляется необходимой оценка экологической безопасности данных методов. На основании многолетних исследований в условиях южной лесостепи Западной Сибири (2004-2016 гг.) с зерновыми, кормовыми, овощными культурами установлено, что применение соединений йода и селена в качестве микроудобрений для сельскохозяйственных культур на почвах, обедненных этими элементами, оказывает не только положительное влияние на их рост и развитие, но и необходимо им. Изучено влияние иод- и селен содержащих соединений (иодида калия, селенита натрия, селената натрия) на химический состав и микробиологическую активность лугово-черноземной почвы. Установлено действие различных концентраций и способов применения йода и селена на лабораторную всхожесть семян, урожайность и качество зерна зерновых культур. Исследования позволили выявить наиболее отзывчивую на применение йода и селена в качестве микроудобрения зерновую культуру - это яровая мягкая пшеница. Выявлена прямая зависимость между увеличением вносимых доз селена и йода (до 15 кг/га) и их содержанием этих элементов в зерне пшеницы. В условиях опыта содержание йода в зерне пшеницы не превышает установленных в литературе токсических дозировок для растений. В то же время при основном внесении Se в дозах 12–15 кг/га в зерне пшеницы накапливается значительное содержание селена (свыше 5 мг/кг), что может представлять опасность для животных, потребляющих данную растениеводческую продукцию. Полученные результаты могут быть использованы в разработке экологически безопасных оптимальных способов применения йод- и селенсодержащих микроудобрений в конкретных агроэкологических условиях.

Ключевые слова: яровая пшеница, почва, селен, йод, микроудобрения

DEVELOPMENT OF ENVIRONMENTALLY SAFE METHODS FOR ENRICHING AGRICULTURAL CROPS WITH SELENIUM AND IODINE IN WESTERN SIBERIA

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One of the most pressing environmental problems is the problem of microelementosis. The territories of many regions of the world are insufficiently provided with selenium and iodine. An effective way to optimize selenium and iodine status is agrochemical - the use of micronutrients for a number of agricultural crops in specific agroecological conditions. At the same time, the necessary assessment of the environmental safety of these methods is provided. On the basis of long-term research in the conditions of the southern forest-steppe of Western Siberia (2004-2016) with grain, fodder, and vegetable crops, it was established that the use of iodine and selenium as micro-nutrients for agricultural crops on soils depleted by these elements has not only a positive effect on their growth and development, but is also necessary for them. The influence of iodine-and selenium - containing compounds (potassium iodide, sodium selenite, sodium selenite) on the chemical composition and microbiological activity of meadow-chernozem soil was studied. The effect of different concentrations and methods of application of iodine and selenium on laboratory seed germination, yield and grain quality of grain crops was established. Research has revealed the most responsive to the use of iodine and selenium as a micro-fertilizer grain crop - this is spring soft wheat. A direct relationship was found between the increase in the introduced doses of selenium and iodine (up to 15 kg/ha) and their content of these elements in millet grain. Under experimental conditions, the content of iodine in wheat grain does not exceed the established toxic dosages for plants in the literature. At the same time, when Se is applied in doses of 12-15 kg/ha, a significant selenium content (over 5 mg/kg) ac-cumulates in wheat grain, which can be dangerous for animals that consume this crop production. The results obtained can be used in the development of environmentally safe experimental methods for the use of iodine-and selenium-containing micronutrients in specific agroecological conditions.

Keywords: spring wheat, soil, selenium, iodine, micronutrients.

PRIMENA ADSORPCIONIH IZOTERMI ZA OPISIVANJE MEHANIZMA PROCESA BIOSORPCIJE JONA BAKRA NA GLAVAMA SUNCOKRETA

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U ovom radu, Langmuir-ov, Freundlich-ov i Temkin-ov model adsorpcione izoterme su korišćeni za opisivanje mehanizma procesa biosorpcije jona bakra na glavama suncokreta. Istraživanje je sprovedeno u reaktorima sa mešanjem. Svi parametri modela adsorpcionih izotermi izračunati su sa linearizovanih grafika koji odgovaraju svakom modelu. Prema dobijenim rezultatima, Temkin-ov model adsorpcione izoterme pokazuje najbolje slaganje sa analiziranim eksperimentalnim podacima, sa koeficijentom korelacije R^2 = 0,997. Langmuir-ov i Freundlich-ov model takođe su pokazali zadovoljavajuće slaganje sa eksperimentalnim podacima, sa koeficijentima korelacije R^2 = 0,888 i R^2 = 0,856, respektivno.

Ključne reči: adsorpcione izoterme, biosorpcija, glava suncokreta, joni bakra, mehanizam biosorpcije.

APLICATION OF ADSORPTION ISOTHERMS FOR DESCRIBING THE MECHANISM OF THE BIOSORPTION OF COPPER IONS ONTO SUNFLOWER HEADS

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ABSTRACT
In this study, Langmuir, Freundlich and Temkin adsorption isotherm models were used to describe the mechanism of the biosorption process of copper ions onto sunflower heads. The study was performed in batch conditions. All the isotherm parameters were calculated from the linearized plots corresponding to each model. According to the obtained results, the Temkin isotherm model fits best with the analyzed experimental data, with R^2 = 0.997. Langmuir and Freundlich isotherm models also give satisfactory fitting of the analyzed data, with R^2 = 0.888 and R^2 = 0.856, respectively.

Keywords: adsorption isotherms, biosorption, sunflower heads, copper ions biosorption mechanism.

PHYTOEXTRACTION OF HEAVY METALS FROM POLLUTED SOILS

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Heavy metals are a large group of chemical elements with atomic mass more than 50 conventional units. They enter in a soil by various ways: together with gas-dust emissions, atmospheric precipitation, irrigation water polluted with industrial waste etc. Humans may receive «their share» of heavy metals not only directly with inhaled air and soil dust, but also with food produced on polluted farmlands. The adverse effect of heavy metals on humans is that some compounds have high toxicity and carcinogenicity. Especially dangerous are emissions of metallurgical plants, which cause an increase in morbidity and mortality from malignant neoplasms, among which carcinoma of the lungs ranks first. Meanwhile, different methods of cleaning soils from heavy metals are known, among which phytoextraction is of particular interest. It involves planting and cultivating specially selected species of agricultural plants for a certain period at polluted sites to extract heavy metals from the soil by the root system and to accumulate them in the aboveground biomass for subsequent utilization. The coefficient of metal accumulation in plants is raised by application of phytoextraction effectors into the soil. This technology is considered as simple for realization, soil sparing, and economically expedient, as compared to mechanical and physicochemical approaches. However, phytoextraction has several specific features. The concentration of heavy metals in the soil of polluted sites should be adequate for plant, i.e., without causing explicit phytotoxic symptoms in sprouts, which characterizes their tolerance to heavy metals and simultaneously their capacity for absorbing the latter by the root system and displacing them to the aboveground biomass with a flow produced by water evaporation from the leaf surface of plants. Plants using for soil cleaning should have a high rate of growth, large aboveground biomass, deeply growing root system, high resistance to diseases and pests, tolerance to common farm practices, convenience for harvesting, and unattractiveness for domestic and wild animals. To improve the accumulation of heavy metals in plants, it is necessary to use the phytoextraction effectors as complexones from the number of polyamine acetic acids. These substances are capable of forming stable water-soluble intracomplex compounds with many metals and increase the solubility and mobility of metals in soil and, hence, their absorption by the root system and accumulation in the aboveground biomass. Usually phytoextraction effectors as aquatic solutions of their salts are used under plants during the phase when their aboveground biomass reaches its maximum. This method permits multiple planting and cultivation of plants during even one vegetative season and, hence, reduction of time to clean the heavy metals from soil. Soil should be cleaned from heavy metals to meet the corresponding sanitary-hygienic norms, i.e., maximum permissible concentrations. The final stage of phytoextraction is harvesting, collection, and utilization of the aboveground plant biomass, which is polluted with heavy metals. The aboveground plant biomass may subsequently be used for extraction of nonferrous metals from it by preliminary drying, ashing, and subsequent special treatment.

Keywords: heavy metals, soil, pollution, phytoextraction, effectors of phytoextraction.

ODRŽIVO UPRAVLJANJE ŽIVOTNOM SREDINOM KORIŠĆENJEM TEHNIKA FITOREMEDIJACIJE ZEMLJIŠTA

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Povećanje zagađenja i eksploatacije zemljišta i voda dovodi do potrebe za korišćenjem novih tehnologija za njihovo saniranje. Cilj ovog rada je da ukaže na značaj fitoremedijacije kao potpuno nove ekološke tehnologije, sa ciljem održivog upravljanja životnom sredinom. Fundamentalna i primijenjena istraživanja nedvosmisleno su pokazala da određene biljne vrste posjeduju genetički potencijal za uklanjanje, rastvaranje, pokretanje ili blokiranje širokog spektra zagađivača ili štetnih elemenata. U radu se opisuje primena fitoremedijacije, uslovi za njeno odvijanje kao i različite fitoremedijacione tehnike.

Ključne reči: fitoremedijacija, fitoremedijacione tehnike, teški metali, održivi razvoj.

SUSTAINABLE ENVIRONMENT MANAGEMENT BY USING OF PHYTOREMEDIATION TECHNOLOGY

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Increasing pollution and exploitation of soil and water leads to the need to use new technologies for their remediation. The aim of this paper is to point out the importance of phytoremediation as a completely new ecological technology, with the aim of sustainable environmental management. Fundamental and applied research has unambiguously demonstrated that certain plant species possess the genetic potential for the removal, dissolution, initiation or blocking of a wide spectrum of pollutants or harmful elements. This paper describes the application of phytoremediation, the conditions for its disintegration and various phytoremediation techniques.

Keywords: phytoremediation, phytoremediation techniques, heavy metals, sustainable development.

ACCUMULATION OF METALS AND ARSENIC BY ECOGROUPS OF PLANTS AND LICHENS UNDER CONDITIONS OF TECHNOGENIC INFLUENCE

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In the Ardon river basin (North Ossetia), there is an intensive accumulation of metals and arsenic, which is dangerous for local livestock and public health. Outside the ore zone in the upper reaches of the Ardon river, the lowest content of lead was recorded in the mowing of meadow grasses; it accumulates an order of magnitude higher in representatives of the xerophytic prickly grass. Lithophytes-scale lichens are the most enriched with lead: 72.5 mg/kg. In the lower reaches of the Ardon river on the plain outside the mining and industrial area, when the content in the soils (85-87 mg/kg) in the mowing of floodplain grasses was found Pb 1.5 mg/kg, in meadow grasses - 2.5 mg/kg, in wood grasses - close values for alder and willow (1.5 - 2 mg/kg). Different levels of accumulation of metals by organisms were determined depending on the nature of the source of contamination. The most severe pollution was observed in the group of hydrophilic mosses: Pb - 84-198, Cd - 3,9-6,6, Cu - 49-218, Zn -1060-3250 mg/kg of dry matter. In edaphophytes the source of pollution is the feeding of soils with arch water from dumps: Pb - 95, Cd - 4,3, Cu - 30, Zn - 675 mg/kg. Lithophilic mosses get the most enrichment directly from the ore rock, living on mineralized dumps: Pb - 159, Cd - 2,1-2,6, Cu - 66, Zn - 480 mg/kg. High levels of heavy metals (Pb - 96, Cd - 2.1, Cu - 70, Zn - 1780 mg/kg) in epiphytic mosses collected on the bark of fruit trees at an altitude of 1.5 - 2 m above the soil are associated with air transport of enriched pulp from the Unal tailings storage facility. There are 5 types of moss concentrators of different ecotypes: *Amblystegium serpens, Brachythecium rivulare, Cirriphyllum cirrisum, Drepanocladus aduncus, Pylaisiella polyantha*, which can serve as indicators of heavy metal pollution in three environments (air, water, soil).

Keywords: accumulation, heavy metals, arsenic, teams of plants, technogenic influence.

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ACTIVATED COALS IN ENVIRONMENTAL PROTECTION FROM HERBICIDE POLLUTION

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In the practice of the use of herbicides as chemicals for weed control, soil cover pollution cannot be excluded in test areas and storing places or as a result of errors, overdosage, or outflows in the direct use of preparations. In this case, polluted soil becomes a source of herbicide migration to surface and underground waters. Under these conditions, it is important to immobilize a herbicide in order to restrict its mobility and toxic action, which manifest in the liquid phase of soil. The application of activated coals as sorbents with a developed pore structure is considered one of the most efficient ways for herbicide immobilization in polluted soil. It is believed that the adsorbed herbicide is retained in the pore structure of coal and thus loses its mobility; it becomes isolated from the root system of plants to dramatically restrict its toxic action. The aim of this work was to evaluate the sorption capacity of two types of activated coals (OPATU and ALP) for 2,4-dichlorophenoxyacetic acid (2,4-D) herbicide, which is used as salts and esters for weed control in cereals and corn. The laboratory research was performed with a sample of slightly loamy soil (Moscow region, 55°37' N, 37°44' E; Russia). Soil pollution as a result of erroneous overdosage, or outflows was simulated by application of an aqueous solution of the 2,4-D as a potassium salt in a concentration of 0.36 g/l or 0.1 g/kg soil. The sorption of this substance by two types of activated coals, which were added to the polluted soil in amounts of 1 and 10 g/kg, was studied. The soil samples (50 g) were moistened with an aqueous solution of 2,4-D (70% of soil full moisture capacity) and mixed with activated coals in Petri dishes, were incubated at 30°C for three days. The effect of 2,4-D sorption by activated coals was evaluated based on the substance concentration in the liquid phase of soil obtained by centrifugation (15000 rpm; 10 min). This concentration was determination by high-pressure liquid chromatography (40 bar) on a LIQUOPUMP 312/1 (UV-DETECTOR 308) instrument at a wavelength of 280 nm. A CH_3OH-H_2O-CH_3COOH mixture (160:90:1) was used as a mobile phase. We found experimentally that at application of activated coals, the concentration of 2,4-D in the liquid phase of soil became lower by one or two orders of magnitude than that in a control variant (without the application of activated coals) as a result of substance sorption. The micropores of activated coals as adsorbing pores, which are responsible for the liquid-phase of the 2,4-D herbicide in this case, are a determining factor of this process. It is well known that activated coals with a micropore volume of 0.2-0.3 cm^3/g or higher usually are used in the detoxication of soils polluted by herbicides. The characteristics of the OPATU and ALP test coals are consistent with the above values (0.4 and 0.2 cm^3/g, respectively). Thus, we experimentally found the advantage of laboratory simulation, which allowed us to rapidly obtain required information on the sorption capacity of activated coals for herbicides. Experiments of this kind are of importance for effectiveness performing the subsequent field tests of various activated coals for the detoxication of soils polluted by herbicides, hence, in environmental protection from herbicide pollution.

Keywords: environmental protection, soil, herbicide 2,4-D, activated coals, sorption.

AMPHIBIANS - INDICATORS OF ENVIRONMENTAL POLLUTION BY HEAVY METALS IN MOUNTAINOUS AREAS

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Under conditions of the polymetallic biogeochemical provinces of North Ossetia (the Ardon river basin), the species of the little Asian frog (*Rana macrocnemis*) dominated in comparison with the lake frog (*R. ridibunda*). At the same time, during the observation period (August), males prevailed, they were selected almost twice as many as females. The body length of adult amphibians varied from 50 to 77 mm, and the ratio of total body mass to liver mass ranged from 27.7 to 62.5. The hemoglobin level varied in amphibians from 59 to 172 g/L, but in most cases it was close to 100-110 g/L. The activity of glutathione peroxidase varied greatly from 386 (little Asian frog, Unal, near the bridge) to 2862 MicroM/min/g Hb (same species, dump, Unal-don). In the background areas (Loire, Tamisk), the activity of the enzyme was 865-1120 MicroM/min/g Hb. In general, the activity of this enzyme was almost 3 times higher compared to mammals (farm animals). Since the activity of blood glutathione peroxidase is correlated with the Se status, it can be assumed that the biogeochemical status of this trace element in the p basin. Ardon is normal, which is confirmed by the results obtained earlier on the content of selenium in plants and waters. The activity of the second blood enzyme - delta-aminolevulinic acid dehydratase (d- ALA) varies from 0.12 (Upper Zgid) to 1.36 units (ibid) in the little Asian frog. In the background areas (Loire, Tamisk) activity ranges from 0.35 to 0.95 units. Inhibition of the activity of this enzyme in animals is associated with Pb intoxication. Intensive accumulation of metals in the amphibian liver was accompanied in some cases by activation of metallothioneine synthesis.

Keywords: amphibians, heavy metals, environmental pollution, monitoring, indicators, mountainous areas

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PASIVNI SEMPLERI KAO PREDIKTABILNI ALAT ZA PROCENU USVAJANJA PAH JEDINJENJA OD STRANE POVRTARSKIH KULTURA

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Pasivni sempleri su do sada bili testirani kao biomimetički alati za procenu pristupačnost štetnih jedinjenja, uključujući policiklične aromatične ugljovodonike (PAH), u vodi i sedimenatima. Međutim, samo nekoliko studija porede akumulaciju PAH jedinjenja u biljkama i pasivnim semplerima u zemljišnom okruženju. Ova studija procenjuje sposobnost dva pasivna semplera, TECAM (membrana od celuloze acetata sa trioleinom) i PECAM (membrana od celuloze acetata sa petroselnom kiselinom) u predviđanju akumulacije PAH jedinjenja u korenu šargarepe (Daucus carota) i kupusa (Brassica oleracea var. capitata), uzgajanih na veštački kontaminiranom pesku u stakleniku. Takođe, ona poredi kinetiku usvajanja PAH jedinjenja u biljkama i semplerima u periodu od 50 dana. Prediktabilna sposobnost membrana zavisila je od tipa biljnog korena sa kojim je upoređivana. Prosečna akumulacija svih ispitivanih PAH jedinjenja u TECAM i PECAM semplerima bila je bliža akumulaciji u korenu kupusa (odnos od 1.08 i 1.18, respektivno) u poređenju sa korenom šargarepe, gde je predikcija usvajanja bila veća kod TECAM semplera (2.09 puta) i manja kod PECAM semplera (0.55 puta). Kinetika usvajanja PAH jedinjenja od strane korena šargarepe i kupusa je bila mnogo sporija i nije dostigla ekvilibrijum sa koncentracijom većine ovih jedinjenja u pesku čak ni posle 50 dana, u poređenju sa TECAM i PECAM semplerima, kod kojih je ekvilibrijum sa peskom postignut u periodu do 3 dana. Rezultati indiciraju da PECAM sempler ima bolju prediktabilnu sposobnost od TECAM semplera, ali bi tu sposobnost trebalo dalje ispitivati u zemljišnom okruženju, gde su prisutni konkurentni absorberi za PAH jedinjenja, kao što je organska materija zemljišta.

Kljične reči: policiklični aromatični ugljovodonici, PECAM, TECAM, koren šargarepe, koren kupusa, pristupačnost, pasivni sempleri.

PASSIVE SAMPLERS AS A PREDICTABILITY TOOL FOR UPTAKE EVALUATION OF PAHs BY CROP PLANTS

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Passive samplers have been tested as biomimetic tools for assessment of bioavailability of environmental chemicals including polycyclic aromatic hydrocarbons (PAHs) in water and sediments. However, only a few studies compare plant accumulation and these biomimetic methods in soil environment. This study assessed capability of two passive samplers, triolein embedded cellulose acetate membrane (TECAM) and petroselinic acid embedded cellulose acetate membrane (PECAM) to predict root accumulation of PAHs in carrot (Daucus carota) and cabbage (Brassica oleracea var. capitata) grown in spiked sand under greenhouse conditions and compared their uptake kinetics in the course of 50 days. The predictive capability of the membranes depended on the type of plant root used for the comparison. The average accumulation of all assessed PAHs in TECAM and PECAM were closer to those of cabbage root (ratio of 1.08 and 1.18 respectively) compared to carrot root where an overprediction in TECAM (2.09 times higher concentration) and an underprediction in PECAM (0.55 times lower concentration) occurred. Carrot and cabbage root uptake kinetics were much slower and didn't reach equilibrium with most of the PAHs in the surrounding sand over 50 days, unlike TECAM and PECAM which PAH concentrations achieved equilibrium with sand within 3 days. The results indicate that PECAM has better predictive potential then TECAM but its predictive capability should be further investigated in soil environment where competitive sinks for PAHs, such as soil organic matter, are present.

Keywords: polycyclic aromatic hydrocarbons, PECAM, TECAM, carrot root, cabbage root, bioavailability, passive samplers.

RELATIONSHIP OF CALVES' BLOOD COMPONENTS INVOLVED IN DETOXIFICATION PROCESSES

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The concentrations of hemoglobin, total glutathione, metallothionein (MT), zinc, copper, and superoxide dismutase (SOD) activity in the blood of calves were compared. A positive correlation was established between the levels of zinc and copper and the activity of SOD, as well as between the concentrations of total glutathione and MTs in the blood of calves. At the same time, the level of total glutathione varies markedly. The concentrations of zinc in the calves' blood vary markedly, varying from 1.50 to 4.58 mg/L, on average, the calves' blood has a zinc content of 2.60 ± 0.60 mg/L. For copper, there is a similar data spread: from 0.78 to 2.18 mg/Ll, averaging 1.08 ± 0.22 mg/Ll. The average value for the concentration of copper in the blood of calves is close to the most common content of trace elements in the blood of terrestrial mammals.

The content of glutathione varies from 80.3 to 255.2 mg/Ll, that is, 3 times, as in the case of trace elements. This indicates noticeable differences in the metabolic processes of fast-growing animals. The MT content is significantly lower than glutathione and varies from 7.9 to 19.6 mg/L The average MT content in the blood of calves is 13.3 ± 2.8 mg/L.

The data obtained indicate a certain relationship between the activity of SOD in the blood of calves and the concentrations of trace elements of copper and zinc. In this case, the most significant relationship is characteristic of copper. A significant positive correlation was established between the activity of SOD and the concentrations of zinc ($r = 0.64$) and especially copper ($r = 0.87$) in the blood of young animals. Of interest is the differentiation of the trace element composition of SOD in the blood of various animals during their development, as well as the existence of a dependence of SOD activity on the status of these trace elements in the environment and feed. With regard to glutathione and MT, the data showed different metabolic pathways with participation of SOD and SH-substances. At the same, time it is of interest to activate their synthesis in extreme geochemical conditions with an excess of metals in the environment and animal feed.

Keywords: cattle, calves, superoxide dismutase, glutathione, metallothioneins, zinc, copper, blood, detoxification process.

This study was supported by the Russian Foundation for Basic Research (Project No. 19-05-00054A).

MAN-MADE SUBTOXICOSIS OF FARM ANIMALS DUE TO THE ABUNDANCE OF LEAD IN THE ENVIRONMENT AND FEED

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Biochemical studies of the blood of cattle living in the Ardon river basin (North Ossetia) were carried out. At the same time, animals from Mizur (the most lead-polluted area) and Alagir (the background area) were compared. The level of hemoglobin in animals from Mizur was higher (123-203 g/L) than in calves from Alagir (145-177 g/L). But in both cases, this is higher than normal values for lowland cattle (95-125 g/L), which is due to the altitude factor. The activity of glutathione peroxidase (GPX) in both cases was within normal physiological values and ranged between 214-380 (Mizur) and 21-394 microM/min/g Hb. This is consistent with the normal level of selenium in plant cuttings (110-200 mcg/kg) and its concentration in the whole blood of animals (0.94-1.48 microM/L). The activity of delta-aminolevulinic acid dehydratase (d- ALA) in animals of both localities was low (below normal). However, the activity of this enzyme in calves from Mizur is almost 2 times lower than in calves from Alagir. In the blood serum of cattle (cows), there was a decrease in the activity of the enzyme acetylcholinesterase. A decrease in calcium concentrations in the blood of animals living in the zone of the Mizur mining and processing plant was also found. Increased zinc content was typical for animals in the province (3.65-6.82 microM/L). There were no significant differences in the levels of magnesium, copper, and selenium. The data obtained indicate lead intoxication in animals, especially in Mizur.

Keywords: blood, cattle, lead, subtoxicosis, technogenesis

BIOGEOCHEMISTRY OF THE CASPIAN AQUATIC ECOSYSTEM IN CONDITIONS OF TECHNOGENESIS IN BIOSPHERE

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Distribution of metals in the components of biogeocoenosis is determined not only by the geochemistry medium, but also by the enormous role of living organisms that utilize metals, thus making them more bioavailable, involving them in the trophic cycle (Vernadsky, 1987).
In the modern era of technogenic changes in biosphere the objective necessity is to evaluate the existing global biospheric processes and the evolution of biogeochemical cycles (Vernadsky, 1960, 1965; Kovalsky, 1960; Vinogradov, 1998; Moiseenko et al., 2002; 2006; 2011, 2012; 2014; Ermakov, Tyutikov, 2008).
The Caspian Sea is a unique inland drainless water reservoir with ocean-type bedding formed about 10 million years ago. It is replenished with biogenic elements due to the river flows and atmospheric precipitation. The Caspian Sea is a special biogeochemical province; therefore, studying its biogeochemical background, as well as its specific features and regularities of the chemical elements migration from the abiotic to the biotic condition, and vice versa, makes the relevance of the research.
Biogeochemical monitoring is currently used both in the areas exposed to the anthropogenic sources and in the background areas. Many authors - Kashulin et al. (1999), Souissi Jamila (2000), Moiseenko et al. (2006), Andreev, Gershtansky (2007), Ermakov, Tyutikov (2008), Meshcheryakova et al. (2008), etc. – point to the possibility to use the living organisms, in particular, the aquatic organisms as test objects.
In the course of the research it has been stated that silty bottom sediments are the main concentrators of metals, as compared to the sandy and shelly grounds. In all the studied types of bottom sediments iron is accumulated in the greatest amount, when accumulation of mercury is negligible. The mean values of all the studied chemical elements in the ground are significantly lower than their clarkes in the Earth's crust. Among all the investigated benthic organisms, didacna (*Didacna sp*.) is a concentrator of cadmium and nickel.
The data correlation analysis has showed that the mercury content in the liver and muscles of sturgeons was significantly dependent on the age, length and weight of the fish species. There has been found the direct correlation dependence between selenium concentration in the muscle tissue and the weight of the fish. The analysis results indicate that the accumulation of mercury and selenium in the body of Persian and Russian sturgeons takes place due to their specific physiological characteristics, as well as to the properties of the elements. The concentration of mercury in the liver and muscles of the fish studied is low and corresponds to the standards established in Russia. Concentration of selenium in the fish liver increases along with growing concentration of mercury, which shows the protective function of selenium against heavy metals.
It has been inferred that the Caspian seal had the maximum concentration of cadmium in the kidneys, mercury in the liver, and lead in adipose tissue. The data obtained allow to conclude that the accumulation of mercury and cadmium in the organs of the Caspian seal increases with age, while the accumulation of lead decreases. This fact testifies to the different ways of accumulation of mercury, cadmium and lead by organs and tissues of the Caspian seal and depends, first of all, on their functional characteristics, as well as on the properties of the researched metals.

Keywords: biogeochemistry, microelements, hydrobionts, soils, bottom sediments, the Caspian Sea, benthic organisms, Russian sturgeon, Persian sturgeon, Caspian seal, microelement migration in food chains, organisms-concentrators.

EFFECTIVENESS OF BIOGEOCHEMICAL TECHNOLOGY OF DISTURBED SOIL RECULTIVATION IN THE TAZ PENINSULA (RUSSIA)

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An examination of the effectiveness of the innovative biogeochemical technology of disturbed soil recultivation in the Taz peninsula (68°09' N, 76°02' E; The Yamalo-Nenets Autonomous District, Russia), as in the territory of operation of “Gazprom Dobycha Yamburg” LLC was carried out by dehydrogenase enzyme activity analysis and growing of perennial cereal grass mixture. The first stage was a comparative enzyme activity analysis of different samples of tundra soils and peat, namely, from background area (gleyzem cryogenic-ferritization tundra soil), and also from site, planned for recultivation (disturbed soil), peat deposit (peat), as well as from the immediate area of recultivation (recultivated soil). So, low dehydrogenase enzyme activity observed in disturbed soil, i.e. it was 5-9 times lower than activity of gleyzem cryogenic-ferritization tundra soil used in our research as a reference. The application of peat into the disturbed soil and the use of potassium humate at growing of perennial cereal grasses should have led to an increase of the dehydrogenase enzyme activity. Indeed, the dehydrogenase enzyme activity in recultivated soil (in dynamics) was more than in disturbed soil, at 27-57 times. A stimulating effect of peat is illustrated by the fact that its activity was higher than activity of gleyzem cryogenic-ferritization tundra soil at 3 times. It is symptomatic that the dehydrogenase enzyme activity positively correlated with the content of organic carbon, which is a confirmation of the correctness of the research results. In the second stage, a comparative assessment of the potential of recultivation of disturbed soil by carrying out of a pot experiment with the growing of perennial cereal grasses. This grass mixture was grown in disturbed soil (control), disturbed soil with the addition of peat (peat:soil - 1:6), determined depending on its full moisture capacity, as well as in disturbed soil with the addition of peat in the ratio of peat:soil - 1:6 and 0.125% aqueous solution of potassium humate. Sowing of seeds of perennial cereal grasses was carried out at the rate of 30 g/m^2. The results of this two-week pot experiment showed that the biomass of perennial cereal grasses has a distinct tendency to increase from disturbed soil further through disturbed soil with the addition of peat and to disturbed soil with the joint use of peat and potassium humate, So, if the biomass of perennial grasses when adding peat to the soil increases by 15%, with the addition of peat and potassium humate by 50% relative to the control, which indicates a large potential for recultivation of disturbed soil joint using peat and potassium humate. Thus, the examination of the innovative biogeochemical technology of recultivation of disturbed soils in the Taz peninsula, confirmed the effectiveness of technology by dehydrogenase enzyme activity analysis and growing of perennial cereal grasses.

Keywords: the Taz peninsula, disturbed soils, biogeochemical technology, examination of effectiveness.

RASPODELA MASENIH KONCENTRACIJA KALIJUMA, RADIJUMA I TORIJUMA U ZEMLJIŠTU REONA DOBRA, NP ĐERDAP

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Uzorci zemljišta (26) sakupljeni su u junu 2018. godine na teritoriji Nacionalnog parka Đerdap (reon Dobra, iz 6 gazdinskih jedinica). U radu su prikazane masene koncentracije kalijuma, radijuma i torijuma, koje su izračunate na osnovu gamaspektrometrijski izmerenih aktivnosti radionuklida. Srednje vrednosti masenih koncentracija analiziranih elemenata u uzorcima zemljišta iznose za kalijum 1,53%, radijum 2,07 mg/kg, torijum 6,80 mg/kg. Izračunate su jačine apsorbovanih doza gama zračenja koje potiču od aktivnosti radionuklida u zemljištu, kao i godišnje efektivne doze. Vrednosti jačine apsorbovane doze gama zračenja i godišnje efektivne doze od eksternog izlaganja gama zračenja na osnovu nivoa aktivnosti prirodnih radionuklida u zemljištu bile su u opsegu očekivanih i blizu prosečnih vrednosti u svetu.

Ključne reči: NP Đerdap, masene koncentracije, kalijum, torijum, radijum.

THE DISTRIBUTION OF THE MASS CONCENTRATIONS OF POTASSIUM, THORIUM AND RADIUM IN SOILS REON DOBRA, NP ĐERDAP

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Soil samples (26) were collected in June 2018, on the territory of NP Đerdap (from region Dobra, 6 management units). In this study, the mass concentrations of potassium, radium and thorium, were calculated based on specific activities of these radionuclides measured by gamma-ray spectrometry. The mean values of elemental mass concentrations in analyzed soil samples were found to be 1.53% for potassium, 2.07 mg/kg for radium and 6.80 mg/kg for thorium. The strength of the absorbed gamma radiation dose originating from the activity of radionuclides in the soil and the yearly effective dose were determined. Values of the strength of the absorbed gamma radiation dose and the yearly effective dose from external exposure to gamma radiation based on the content of natural radionuclides in soil were in the range of the expected values and close to the average values in the world.

Keywords: NP Đerdap, mass concentration, potassium, thorium, radium.

MACERAT KESTENA KAO POTENCIJALNI EKOLOŠKI INHIBITOR KOROZIJE ČELIKA U HLORIDNOJ SREDINI

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U poslednje vreme aktuelna su istraživanja u oblasti primene prirodnih inhibitora kod kojih se kao ključni kriterijum za primenu postavlja njihova ekološka prihvatljivost. S tim u vezi, analizirali smo elektrohemijsko ponašanje čelika X180CrMo12-1 pri oksidaciji u rastvoru 0,3 mol/dm^3 NaCl u odsustvu i prisustvu macerata kestena različitih koncentracija. Elektrohemijsko ponašanje čelika ispitivano je metodom merenja potencijala otvorenog kola, metodom ciklične voltametrije i potenciostatskom metodom. Promena potencijala otvorenog kola za čelik praćena je u toku 1800 s od trenutka uranjanja elektrode. Rezultati merenja potencijala otvorenog kola pokazuju da su vrednosti potencijala otvorenog kola pozitivnije u odnosu na vrednosti potencijala otvorenog kola bez dodatka macerata kestena. Voltamogrami su snimani brzinom promene potencijala od 100 mV/s u oblasti potencijala od -1,6 V vs. ZKE do 0 V vs. ZKE. Na voltamogramu dobijenom bez prisustva macerata kestena nema jasno definisanih strujnih pikova, već samo jedan vrlo širok i nizak strujni talas u širokoj oblasti potencijala pre nego što dođe do naglog porasta gustine struje, i jedan strujni pik na povratnom delu voltamograma. Sa dodatkom macerata kestena vrednosti gustine struje su niže u odnosu na vrednosti gustine struje bez dodatka macerata kestena. Niže vrednosti gustine struje u prisustvu macerata kestena ukazuju na to da macerat kestena ima inhibitorsko dejstvo. Potenciostatska ispitivanja su vršena na -0,2 V vs. ZKE u trajanju od 100 s i temperaturi od 25°C. Potenciostatske krive pokazuju da vrednosti stacionarne gustine struje opadaju sa povećanjem koncentracije macerata kestena. Površina čelika je analizirana optičkom mikroskopijom nakon potenciostatske oksidacije. Analiza je pokazala da što je veća koncentracija macerata u rastvoru, oštećenja na površini čelika su manja i bolja je zaštita od korozije.

Ključne reči: čelik, elektrohemijsko ponašanje, macerat kestena, hloridna sredina

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CHESTNUT MACERATE AS A POTENTIAL ENVIRONMENTAL CORROSION INHIBITOR OF STEEL IN CHLORIDE MEDIUM

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Recently, there has been ongoing research in the field of natural inhibitors application where their ecological acceptability is a key criterion. In this regard, this paper presents the results of the investigation into the electrochemical behavior of X180CrMo12-1 steel during oxidation in the solution of 0,3 mol/dm^3 NaCl in the absence or presence of various concentrations of chestnut macerates. The electrochemical behavior of steel was tested by the open circuit potential method, the cyclic voltammetry method and the potentiostatic method. The change of the open circuit potential for the steel was monitored during the 1800 s from the time of immersion of the electrode. The results of the open circuit potential measurements showed that the values of the open circuit potential were more positive than the values of the open circuit potential without the addition of chestnut macerate. Cyclic voltammograms were recorded over a potential range from -1,6 V vs. SCE to 0 V vs. SCE with a scan rate of 100 mV/s. There were no clearly defined current peaks on the voltammogram obtained without the chestnut macerate, but only one very wide and low current wave in a wide range of potentials before a sudden increase in the current density, and one current peak at the reverse part of the voltammogram. With the addition of chestnut macerate, the value of the current density was lower than the value of the current density without the addition of chestnut macerate. Lower values of the current densities in the presence of chestnut macerate suggest that chestnut macerate exhibits an inhibitory effect.
The potentiostatic investigations were performed at a potential -0,2 V vs. SCE for 100 s at 25°C. Potentiostatic curves showed that the values of the stationary current density decreased with the increase of the chestnut macerate concentration. After the potentiostatic oxidation, the surface of the steel was analyzed using optical microscopy. The analysis showed that the higher macerate concentration in the solution resulted in less damage to the surface of the steel and in the better corrosion protection.

Keywords: steel, electrochemical behavior, chestnut macerate, chloride medium

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PROCENA RADIJACIONOG OPTEREĆENJA MAHOVINA SAKUPLJENIH 2018. GODINE U NP ĐERDAP

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Uzorci mahovina (30 uzoraka, 9 vrsta) sakupljeni su junu 2018. godine na teritoriji Nacionalnog parka (NP) Đerdap iz tri regiona (Dobra, Donji Milanovac i Tekija). Jon ^{137}Cs je hemijski i biohemijski homolog kalijuma i u organizmu prati njegov metabolizam. Izmerena specifična aktivnost ^{137}Cs u uzorcima konvertovana je u dozu uz pretpostavku da su sve emitovane čestice apsorbovane u tkivu koje je akumuliralo ^{137}Cs. Određene su apsorbovane doze ^{137}Cs u mahovinama. Srednja vrednost jačine apsorbovane doze (mGy/god) u ispitivanim mahovinama celog parka je bila 0,236; Dobre 0,127; Donjeg Milanovca 0,287 i Tekije 0,303. Jačine apsorbovanih doza u mahovinama sa teritorije NP Đerdap su niže od doza koje izazivaju promene u reproduktivnom ciklusu biljnih i životinjskih organizama i letalnih doza.

Ključne reči: ^{137}Cs, mahovine, apsorbovana doza, radijaciono opterećenje, Đerdap, Srbija.

EVALUATION OF THE RADIATION LOAD OF MOSSES COLLECTED IN 2018 FROM NP ĐERDAP

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Samples of mosses (30 samples, 9 species) were collected in June 2018 on the territory of National Park (NP) Djerdap from three regions (Dobra, Donji Milanovac and Tekija). The ^{137}Cs ion is a chemical homologue of potassium and follows its metabolism in organisms. The measured specific activity of ^{137}Cs in samples was converted into doses with the assumption that all emitted particles were absorbed in tissue that accumulated ^{137}Cs. The absorbed dose strength of ^{137}Cs in moss were determined. The average value of the absorbed dose strengths (mGy/year) in investigated moss samples from all Park was 0.236, from region Dobra 0.127, Donji Milanovac 0.287 and Tekija 0.303. Absorbed dose strengths on the territory of NP Djerdap in moss are lower than the doses causing changes in the reproduction cycle of plant and animal species and lethal doses.

Keywords: ^{137}Cs, mosses, absorbed dose strengths, radiation load, Djerdap, Serbia.

GENOTOXICITY OF SOME BIOLOGICAL OBJECTS AND PRODUCTS DERIVED FROM AQUATIC ORGANISMS.

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Safety, quality and health-improving efficiency of food facilities suggest the absence of pollutants hazardous to human health in food products. However, environmental pollution, especially the oceans, is increasing. Particularly dangerous is the accumulation of persistent organic pollutants in fish tissues, primarily mutagenic compounds. Mutagenic compounds may enter human tissues with drinking water and food; they cause various kinds of mutations and can exhibit carcinogenic and teratogenic effects. In this work, we studied the content of mutagenic compounds in the tissues of fish, and in fish oil obtained from cod liver of *Gadus morhua* and *Macrourus berglax*.

The mutagenicity of the studied extracts was determined using a modified Ames Salmonella semi-quantitative test / microsome with a metabolic activation system based on the microsomal fraction S9 from the liver of male white rats (Wistar line) induced by Aroclor 1254 solution in olive oil (40 mg/kg rat weight). *Salmonella typhimurium* TA-98 and TA-100 strains auxotrophic for histidine were used as indicator strains. Strain TA-98 registers mutations of the reading frame shift type, and TA-100 registers mutations of the base replacement type. Mutagenicity was judged by the frequency of reversals to histidine prototrophy (His +), detected on plates with minimal medium. In experiments without metabolic activation (- MA), a direct mutagenic effect was evaluated. In experiments with metabolic activation (+ MA), the mutagenicity of metabolic products (mutagenic effect) present in the studied samples was revealed. 100 µl of the extract was added to each Petri dish (plate). The extract evaporated on a film evaporator was dissolved in 5 ml of dimethyl sulfoxide (DMSO).

The occurrence of mutagenicity (mutagenic compounds) in the samples of fish oil might be an indication of presence of chemical pollutants in water and food of the fish studied. This is further supported by chemical analysis of the biogenic samples –using chromatography mass spectrometry method.

Chlororganic compounds - isomers of tri-, tetra-, penta-, and hexachlorobiphenyls, as well as the pesticide DDT and its metabolites DDE and DDD, were found in all fat samples.

Each sample contains hydrocarbons of petroleum origin: polycyclic aromatic hydrocarbons, biphenyls, tetrahydronaphthalenes, indenes, alkanes of normal and branched structure, alkylbenzenes, naphthenes. Phthalates, which are used as plasticizers, were found in each of the samples. The maximum amount of phthalates found in fat from cod liver.

Mutagenic chemicals were discovered in fish oil samples of two species of fish, namely, Gadus morhua, Macrourus berglax.

Keywords. Ames Salmonella test / microsomes, mutagens, chromatography-mass spectrometry, ecotoxicants, biological tissues of marine fish, fish oil.

ASSESSMENT OF FLUCTUATING ASYMMETRY OF BIRCH LEAVES AS A POSSIBLE BIOGEOCHEMICAL INDICATOR OF THE ECOLOGICAL STATE OF TERRITORIES

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The research was focused on 17 sites with varying degrees of metal contamination in the Ardon river basin (North Ossetia), where the Mizur mine, the Unal tailing dump, and the dumps of point deposits play a significant role in polluting the natural environment. Background areas at different distances from the tailings dump were located within the Unal village, the Zaramag basin (the upper reaches of the Ardon river), above the Buron village, Alagir city, and the North Ossetian reserve. They are mesophytic grasslands located almost at the same height above sea level (930-990 m). At each point, the floristic composition and biomass of the mowing from 1 m^2 were taken into account. In practice, species biodiversity concerned α-(number of species in habitats) and β-diversity (differences in species in habitats). From each tree of flat-leaved birch *Betula platyphylla* Sukacz, 80 leaves were selected from 4 sides (North, South, West, East) at a height of 1.8-2 m with the maximum number of available branches, with shortened shoots taking into account the illumination of the trees. After the selection of leaves on the same day, measurements were made – determining 5 metric parameters, the average relative difference in the characteristic and the degree of asymmetry of the leaves. It was found that in conditions of polymetallic biogeochemical provinces, a high concentration of the sum of metals in soils and birch leaves is accompanied by an increase in the value of the fluctuating asymmetry (FA) of leaves and sulfur-containing biologically active substances. In conditions of massive pollution (around the tailings storage facility) with the amount of metals in the soil-soils of 1395-5727 mg/kg, the FA value reached 0.05-0.07 units, especially in conditions of tree shading. In the background areas, this parameter changed between 0.02 and 0.04 units. At the same time, there was a relationship between the amount of metals in soils and plants and the value of leaf FA.

Keywords: fluctuating asymmetry, leaves of birch, heavy metals, pollution.

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ORGANOCLAYS - A NEW CLASS OF SORBENTS FOR EFFECTIVE IMMOBILIZATION OF INORGANIC AND ORGANIC POLLUTANTS

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Natural clays as materials with a number of unique properties, such as micro- and nanoporous structure, the presence of surface active centers of various nature, high cation exchange capacity have long been widely used as highly effective sorbents for heavy metals, radioactive isotopes and some organic pollutants in contaminated soils and wastewater. However, the diversity of the composition, structural and textural characteristics of natural clay minerals, the hydrophilic nature of their surfaces, limits their use in environmental protection practice due to low selectivity and weak interaction with non-polar and weakly polar substances. This problem can be solved by the modification of layered silicates by organic substances and the synthesis of organoclays with desired properties - increased absorption capacity, selectivity and environmental friendliness.

We have studied the sorption of heavy metals by bentonite and kaolinite in the presence of widespread natural organic substances - fulvic acids. Fulvic acids enhanced the adsorption of zinc and lead ions by kaolinite in the acidic pH range (at element concentrations 0.4-4.0 mmol/l). There is a tendency to increase the adsorption by kaolinite with an increase in pH. Fulvic acids increased the adsorption of heavy metals by bentonite only at high concentrations of elements in solution (2-4 mmol/l). Adsorption of heavy metals by clay minerals correlated with the content of natural organic matter in solutions and depends on nature of an element. The sequence of adding cations and fulvic acids to clays also influenced the adsorption value, which indicates complex interaction mechanisms in the systems under study.

Based on the our results and existing data about the interactions between clay minerals and organic substances in a solution, it is planned to synthesize row of different organoclays based on clay minerals and natural organic substances for adsorption of trace element ions and polycyclic aromatic hydrocarbons and to study structural, immobilizing and toxic properties of the synthesized sorbents.

Keywords: heavy metals, clay minerals, soil organic substances, adsorption.

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MODELING OF DISTURBED SOIL RECULTIVATION IN THE TAZ PENINSULA (RUSSIA)

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From the geoecological point of view, process of soil recultivation represents the restoration of its fertility lost due to various reasons to which it is possible to refer productive activity of the gas industry in the conditions of the Far North. Very often this is accompanied with mechanical impact on a soil-vegetable cover when soils partially or completely lose a vegetable cover and an organogenic layer, and the mineral horizons come to a day surface. The specified geoenvironmental problem solved on the example of the mechanically disturbed tundra soils of the Taz peninsula (68°09' N, 76°02' E; Yamalo-Nenets Autonomous District, Russia). The main objective of present work consisted in vitro modeling of stimulation of the recultivation of disturbed tundra soils by means of peat addition (peat:soil, 1:4) and an express assessment of this process efficiency with use a catalase and dehydrogenase enzyme activity analysis of soil samples. For this purpose, the representative average samples (0-6 cm layer) of disturbed tundra soils, representing the consolidated sand on granulometric composition, were selected on two sites around the location of installations of the complex gas preparation providing collection and handling of natural gas and gas condensate. On one site the vegetable cover was completely absent; on other site the regeneration of a vegetable cover in the form of certain species of grass-cereal association as well as mosses was noted. The received data showed that closest to catalase activity of peaty-gleezem typical tundra soil as standard taken for 100%, was the corresponding enzyme activity of disturbed soil with a vegetable cover, which during observation made 62-75% that is higher than activity even of the peat used for soil recultivation. It allows to draw a conclusion on a significant contribution of plants to soil enzyme activity through postmortal plant material, due to the enzymes remaining in this material. Apparently what regeneration of a vegetable cover as self-restoration of the disturbed soil was diagnosed by increase in catalase activity. The other picture was observed in case of dehydrogenase activity correlating with total quantity of microorganisms in the soil. So, for the entire period of observation, peat addition significantly increased the dehydrogenase activity of disturbed soil without vegetable cover and, especially with a vegetable cover. Apparently, efficiency of recultivation of the disturbed soils by means of peat is diagnosed by increase in dehydrogenase activity. Meanwhile the dehydrogenase activity of peat, it not only reached the corresponding activity of peaty-gleezem typical tundra soil, but also in the first 5 days was 29% higher. Thus, the relevant results of in vitro modeling that were aimed to peat addition based recultivation of the mechanically disturbed tundra soils of the Taz peninsula showed that catalase and a dehydrogenase activity analysis are fitting for express assessment of recultivation process. The results of the recultivation process modeling were the base of the relevant of innovative biogeochemical technology of soil recultivation.

Keywords: the Taz peninsula, mechanically disturbed soils, modeling of recultivation, regeneration of vegetative cover, peat addition, enzyme activity analysis.

ROLE OF NATURAL AND ANTHROPOGENIC FACTORS IN TRANSFORMATION OF CHEMICAL COMPOSITION OF WATER OF THE RIVER ARDON (NORTH OSSETIA)

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The Sdonsky mining district, located in North Ossetia, is part of the North Caucasus polymetallic belt. A number of Pb-Zn fields are developed in a closed way. Two mining and processing plants are located in the villages of Mizur and Upper Fiagdon. Tailing dumps are associated with them. The largest tailing dump of is located in the Lower Unal village on the left bank of the Unal river. All these objects, as well as dumps and road embankments, are sources of man-made heavy metals (HM) entering the river network. The influence of mudflow processes in the Ardon river basin on the chemical composition of natural and man-made waters was studied. As a result of the mudslide, there were no sharp changes in the composition of natural and man-made waters in the Unal basin. The mineralization of the filtered part of the water from the Ardon river remained the same for almost the entire length and varied from 60 to 90 mg/L, increasing slightly from the source of the river to the mouth (confluence with the Terek river). The redox potential of the Ardon river waters usually increases from the source to the mouth. However, in 2003, its value decreased slightly from 139-193 mV (compared to 188-276 mV in 2001). On the contrary, the pH value of water decreases from the upper reaches of the Ardon river to the mouth: in 2001, the pH varied from 8.00 to 8.28, and after the mudslide in 2003 - from 7.40 to 8.11. In particular, for the Unaldon river, the Eh value decreased from 220 mV in 2001 to 166 mV in 2003, and the pH value increased slightly from 7.15 to 7.24. For another tributary of the Myramdon river, the changes were as follows: Eh - 187 mV (2001) and 193 mV (2003), pH - 8.17 (2001) and 8.07 (2003). In General, the natural disaster of 2003 in the Ardon river basin caused certain changes not only in the morphology of landscapes, but also in the nature of migration of chemical elements as a result of redistribution of mudflow material.

Keywords: chemical composition of water, mineralization, river Ardon, mudflow.

METHODS OF PROTECTION OF SURFACE AND UNDERGROUND WATERS AND SOIL FROM OIL POLLUTION

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It is known that the most serious pollution of surface and underground waters and soil by oil happens at its emergency floods. At the same time, oil coming to surface waters forms the film floating on water, the dissolved or emulsified forms, and its heavy fractions settle on a bottom and are adsorbed by bottom sediments as a source of secondary pollution of water mass. Meanwhile, the main source of oil penetration in underground waters is the soil, which becomes polluted in cases occurring during oil production and transportation. Migration of oil from a soil in underground waters usually comes on pores of the horizons composing a soil profile. The purpose of this work is the presentation of information concerning to problem of methods of protection of surface and underground waters and soil from oil pollution. So to number of basic measures for a remediation of the surface waters polluted by oil the following is belongs: installation the floating booms obstacles having various modifications made of the special fabric having the high durability and resistance to oil impact and employees for restriction of distribution of its film on a water surface and promoting its concentrated collection and also use of the sorbents simplifying and accelerating the procedure of mechanical removal of oil from a water mirror; application for water purification from oil of the hydrocarbons-oxidizing microorganisms preparations representing biomass of active strains; application of nitrogen-phosphorus compounds for stimulation of growth of quantity of microorganisms, and also the neutral sorbent having buoyancy for keeping of bacteria on a surface of a hydrocarbon film are the important part of these preparations. Remediation of the polluted soil as a source of oil penetration in underground waters includes soil cleaning by biological means containing also hydrocarbons-oxidizing microorganisms. So, in our in vitro researches the efficiency of cleaning of oil polluted soil by means of biocompost representing the fermented peat-manure mixture enriched with hydrocarbons-oxidizing microorganisms in quantity of 106 cell/g and also nutrients were estimated. Here oil pollution of the soil was simulated by application to its samples the oil (50 and 100 g/kg) in which then added biocompost (50 and 100 g/kg). Researches on degradation of oil hydrocarbons under the influence of biocompost have shown that the time of almost full degradation of hydrocarbons (t99, day) at concentration of oil in 50 g/kg is reduced rather control variant by 2-5 times, and at concentration of 100 g/kg – 2-4 times. Thus, there are currently proven and sufficiently effective methods to protect surface and underground waters and soil from oil pollution at emergency floods occurring during oil production and transportation.

Keywords: oil, pollution, surface and underground waters, soil, protection, remediation, biocompost, oil hydrocarbons degradation.

PHYTOTOXICITY OF LIQUID LAUNDRY DETERGENT "BLUE MOON" TO LENTIL (*Lens culinaris*) AND MUNG BEAN (*Vigna radiata*)

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Synthetic detergents, including laundry detergents, are a new type of chemical pollutants of the environment, including freshwater and marine aquatic ecosystems. The previous experiments of S.A. Ostroumov discovered toxicity of synthetic detergents to many biological species, e.g., to several species of higher plants. This demonstrated environmental hazards from synthetic detergents, including laundry detergents.

The goal of this work is to answer the question whether the synthetic detergent "Blue Moon" is toxic to higher plants.

"Blue Moon" liquid laundry detergent is a broadly used synthetic detergent across China. Unlike the known toxicity of detergent components (e.g., surfactants, etc.), the overall toxicity of synthetic detergent mixtures has long been unknown yet. To fill this gap in knowledge, the effects of "Blue moon" liquid laundry detergent ("Blue moon"-LLD) on seed germination (SG) and root elongation (RE) of the lentil (*Lens culinaris*) and the mung bean (*Vigna radiata*) was tested in our study.

In the lentil (*Lens culinaris*)-based tests, both SG and RE were measured simultaneously and recorded in the form of percent of germination of the seeds (PGS, %) and the root length (RL, mm) accordingly. As a result, various concentrations (0.1%, 0.5% and 1.0%) of "Blue moon"-LLD caused a decrease in PGS (ca. 0%-80%) and root length (RL, ca. 0-5 mm) after the 72-h incubation, and PGS (ca. 0%-90%) and RL (ca. 0-9 mm) after the 96-h incubation.

Our experiments discovered that "Blue moon"-LLD could inhibit the growth of the *Lens culinaris* and *Vigna radiata* plant species simultaneously. As far as the lentil (*Lens culinaris*) was concerned, RL seems to be a more sensitive and accurate parameter than PGS for phytotoxicity assessment of "Blue moon"-LLD. It may be therefore especially useful for semi-qualitative and quantitative analysis of ecotoxicity, which confirms the results that previously were obtained with bioassay of other detergents and surfactants using some other species of higher plants in the experiments conducted by S.A. Ostroumov and described in the publications.

In the SG test, "Blue moon"-LLD at the range of concentration (0.1%, 0.5% and 1.0%) led to a reduction in SG of *Lens culinaris* (0.0%-72%) and *Vigna radiata* (67%-98%). Analyzing the results of the phytotests, we compared the lentil (*Lens culinaris*) response with the mung bean (*Vigna radiata*) response to "Blue moon"-LLD.

It is interesting to compare the results of this study with the previous results obtained in S. Ostroumov's group at Moscow State University. These previous studies discovered phytotoxic effects of the liquid detergent "Vilva" on the seedlings of the higher plants, the buckweat Fagopyrum esculentum and the rice *Oryza sativa*. At a concentration of "Vilva" 0.25 ml/L, the growth of the seedlings of F. esculentum stopped, and the elongation rate of the seedlings of O. sativa was inhibited by 22-75%.

The new data are in accord with the results of study of effects of another detergent on these two plant species.
Conclusions.

- The authors conducted the bioassay of the liquid laundry detergent ("Blue moon"-LLD) which was made in China, using two species of higher plants, namely of lentils (*Lens culinaris*) and mung beans (*Vigna radiata*).
- This detergent was toxic to the both plant species.
- Both parameters measured were sensitive to the detergent studied.
- The phytotests including *Lens culinaris* and *Vigna radiata* tests are effective and sensitive to assess phytotoxicity. The phytotests are simple and economical to do the toxicity assessments. They are useful tools to do non-animal research of chemicals, including environmental pollutants. Taking in account bioethical and cost-efficiency considerations, higher plant-based bioassays are an efficient and promising method to assess phytotoxicity of chemicals as well as anthropogenic effects in both terrestrial and aquatic ecosystems.

Keywords: phytotoxicity, "Blue Moon" liquid laundry detergent, bioassay, germination, root elongation, phytotest, environmental hazards, lentil, mung bean, *Lens culinaris*, *Vigna radiata*,

HYGIENIC RATING OF HYDROCARBONS IN BOTTOM SEDIMENTS

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Under an emergency entry of hydrocarbons in the form of oil, gas condensate, and their processing products (gasoline, kerosene, and others) into waters ecosystems, the quality of the latter is largely determined by the pollution level of bottom sediments. This is due to the fact that hydrocarbons accumulating bottom sediments, if stirred up by wind impacts, sharp increases in the flow velocity, or dredging of bottom sediments, become a source of the secondary pollution of the water mass. Objective pollution control of bottom sediments is possible only with an experimentally substantiated hygienic standard of the above substances such as their maximum permissible concentrations (MPCs). However today hygienic standards for bottom sediments have not developed thus far, even for priority chemicals substances, including hydrocarbons. The objective of our study was to analyze and generalize information about the hygienic rating of the hydrocarbons in bottom sediments. Studies have concluded that the above rating should be performed through the experimental substantiation of the threshold concentrations by four harmful indices (the general sanitary, water-migration, ichthyo-accumulation, and organoleptic) to establish the limiting harmful index and the MPC value of the hydrocarbons in bottom sediments (mg/kg). Each harmful index is assessed by determining the respective threshold concentration of the hydrocarbons. So, the general sanitary index characterizes the processes of changes in the quantity of microorganisms and their enzymatic activity in bottom sediments under the action of hydrocarbons. The threshold concentration here is the maximal quantity of the substances in bottom sediments that does not cause substantial changes in the quantity of the microorganisms and their enzymatic activity. The water-migration index describes the migration of the hydrocarbons from bottom sediments to the water mass. The threshold concentration is the maximal quantity of the substances in bottom sediments that at entry into water does not lead to an increase in the MPC for water. The ichthyo-accumulation index characterizes the migration of the hydrocarbons from bottom sediments through water into fish and their accumulation in the fishes' tissues and organs. The threshold concentration by this index means the maximal quantity of the substances in bottom sediments under which their accumulation in fishes used as food does not lead to an increase in the permissible residual quantities established for them. The organoleptic index is changes in the smell, flavor, and nutritional value of fishes under the impact of the hydrocarbons. The threshold concentration here is the maximal quantity of the substances in bottom sediments that does not affect the organoleptic indices of fish products. Finally, the experimental substantiation of the threshold concentrations of the hydrocarbons by the above four harmful indices results in choosing as the limiting index the one that has the least threshold value, which will be the MPC of the hydrocarbons in bottom sediments of water ecosystems.

Keywords: hydrocarbons, bottom sediments, hygienic rating, harmful indices, threshold concentrations, maximum permissible concentration.

ANALIZA ZAGAĐENJA VAZDUHA U FUNKCIJI KONCENTRACIJE SUSPENDOVANIH ČESTICA $PM_{2.5}$

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Suspendovane čestice u vazduhu, zbog svog negativnog dejstva na zdravlje ljudi, danas su sve više predmet interesovanja stručnjaka, regulatornih tela i najšire javnosti. Posebna pažnja posvećuje se suspendovanim česticama $PM_{2.5}$ koje, zbog svoje manje veličine, dublje i efikasnije prodiru u pluća čoveka, a izazivaju i negativne efekte na životnu sredinu. U ovom radu analizirane su koncentracije suspendovanih čestica $PM_{2.5}$ iz ambijentalnog vazduha na teritoriji grada Kraljeva, uzorkovanih u periodu od 2015-2019. godine. Gravimetrijskom analizom 1771. uzorka utvrđeno je da se koncentracija ovih čestica kreće u opsegu od 1,81-376,81μg/m^3. Posebno zabrinjava podatak da je čak 48,45% analiziranih uzoraka bilo iznad graničnih i tolerantnih vrednosti. U svakoj godini analiziranog petogodišnjeg perioda uočena je ista pravilnost tj. najveća prekoračenja bila su u periodu grejne sezone što znači da način grejanja u gradu Kraljevu ima dominantnu ulogu u zagađenju vazduha ovim česticama. U cilju očuvanja životne sredine, a posebno zdravlja ljudi, neophodna je primena adekvatnih mera sa posebnim akcentom na osavremenjavanje tehnoloških rešenja za sagorevanje goriva u kotlarnicama i individualnim ložištima.

Ključne reči: Zagađenje vazduha, suspendovane čestice $PM_{2.5}$, gravimetrijska analiza.

ANALYSIS OF AIR POLLUTION IN FUNCTION OF THE CONCENTRATION OF SUSPENDED PARTICLES $PM_{2.5}$

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Suspended airborne particles, due to their negative effects on human health, are now increasingly the subject of interest of experts, regulatory bodies and the general public. Particular attention is paid to suspended $PM_{2.5}$ particles, which, due to their smaller size, go through deeper and more efficiently into the lungs of humans, and also cause negative environmental effects. This paper analyzes the concentrations of suspended $PM_{2.5}$ particles from ambient air in the territory of the city of Kraljevo, sampled in the period 2015-2019 years. Gravimetric analysis of the 1771 sample determined that the concentration of these particles was in the range of 1.81-376.81μg/m^3. Of particular concern is the fact that as many as 48.45% of the analyzed samples were above the limit and tolerance values. The same regularity was observed in each year of the five-year period analyzed, ie. the largest exceedances were during the heating season which means that the heating mode in the city of Kraljevo plays a dominant role in the air pollution of these particles. In order to preserve the environment, and especially human health, it is necessary to apply adequate measures with special emphasis on the modernization of technological solutions for combustion of fuel in boiler rooms and individual combustion plants.

Keywords: air pollution, suspended $PM_{2.5}$ particles, gravimetric analysis.

MONITORING RADIOAKTIVNOSTI U SRBIJI

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Sistematsko ispitivanje radioaktivnosti u životnoj sredini se prema Zakonu od zaštiti od jonizujućeg zračenja i o nuklearnoj sigurnosti vrši radi utvrđivanja prisustva radionuklida u životnoj sredini i procene nivoa izlaganja stanovištva jonizujućim zračenjima i to u redovnim uslovima, u slučaju sumnje na akcident i toku akcidenta.
Sakupljanje i analizu uzoraka obavljaju pravna lica, koja obavljaju poslova zaštite od zračenja, a ovlašćena su od strane Agencije za zaštitu od jonizujućih zračenja i nuklearnu sigurnost Srbije.
U cilju dobijanja pouzdanih podataka vrše se sledeće analize: sadržaj radionuklida u vazduhu, sadržaj radoinuklida u čvrstim i tečnim padavinama, sadržaj radionuklida u površinskim vodama i rečnom sedimentu, sadržaj radionuklida u vodi za piće, sadržaj radionuklida u životnim namirnicama i stočnoj hrani i nivo izlaganja jonizujućem zračenju prirodnog porekla u boravišnim prostorijama i radnoj sredini.
Što se tiče stanja kontaminacije radionuklidima u Republici Srbiji, neophodno je istaći da se u životnoj sredini detektuje određena količina radionuklida, ali da naša zemlja ne pripada kategoriji kritičnog stanja kada je jonizujuće zračenje u pitanju.
Na osnovu detaljnih podataka institucija koje se bave monitoringom radioaktivnosti biće izneti podaci o stanju jonizujućeg zračenja u Republici Srbiji na osnovu merenja obavljenih u 2017. god.

Ključne reči: radionuklidi, jonizujuće zračenje, kontaminacija, monitoring radioaktivnosti.

RADIOACTIVITY MONITORING IN SERBIA

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According to the Law on ionizing radiation protection and nuclear safety, the systematic research of radioactivity in the environment is conducted to determine whether radionuclides are present in the environment and to assess the level of exposure of the population to ionizing radiation in regular circumstances, in case of a suspected accident or during an accident.
The collection and analysis of samples is performed by businesses engaged in radiation protection activities, authorized by the Agency for ionizing radiation protection and nuclear safety of Serbia.
In order to receive reliable data, the following analyses are conducted: the amount of radionuclides in the air, the amount of radionuclides in solid and liquid forms of precipitation, the amount of radionuclides in surface waters and river sediments, the amount of radionuclides in drinking water, the amount of radionuclides in foodstuffs and fodder and the level of exposure to natural sources of ionizing radiation in living quarters and work spaces.
When it comes to the state of contamination with radionuclides in the Republic of Serbia, it is necessary to point out that there is a certain amount of radionuclides detected in the environment, but that Serbia does not belong to the category of critical conditions when it comes to ionizing radiation.
Based on detailed information from institutions engaged in monitoring radioactivity, data on the state of ionizing radiation in the Republic of Serbia based on measurements published in 2017 shall be presented.

Keywords: radionuclides, ionizing radiation, contamination, monitoring radioactivity.

ZNAČAJ AEROZAGAĐENJA U MULTIFAKTORIJALNOM MODELU ALERGIJSKOG RINITISA

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U razvoju alergijskog rinitisa kao multifaktorijalne bolesti značajnu ulogu imaju, pored genetskih faktora, i faktori spoljne sredine sa aerozagađenjem. Svetska zdravstvena organizacija ukazala je na neophodnost kontinuiranog monitoringa polena suspendovanog u vazduhu upravo zbog multifaktorijalne etiopatogeneze alergijskog rinitisa, dok je u Srbiji Zakonom o zaštiti vazduha polen okarakterisan kao aerozagađivač emitovan iz prirode sa mogućim štetnim uticajima po zdravlje stanovništva. Rad predstavlja korelaciju rezultata retrospektivne kliničke studije na uzorku od 352 ispitanika na Odeljenju za otorinolaringologiju Opšte bolnice Pančevo i rezultata aerozagađenja sa kalendarom polenacije Zavoda za javno zdravlje Pančevo na 729 uzoraka u periodu 2015/2016. godina. 24-časovna koncentracija čađi merena je metodom refleksometrije uz korištenje selektivne dvokanalne analize, dok je koncentracija suspendovanih čestica PM10 merena svakog trećeg dana. Za statističku obradu podataka u retrospektivnoj kliničkoj studiji korišteni su apsolutni/relativni brojevi, mere centralne tendencije/disperzije i HI-kvadrat test. Od uzorka SPT-testiranja na 352 ispitanika, 154 su imali pozitivan test na inhalatorne alergene. Najčešća senzibilizacija u odnosu na inhalatorne alergene bila je na *Dermatophag.pter* 40,2%, iz grupe polena korova *Ambrosia elat*. 28,5%, iz grupe polena trava *Lolium p. Dactylis. glom*. 27,2% i iz grupe polena drveća *Betula veru*. 12,3%. Merenje aerozagađenja pokazalo je na uzorku od 729 mesta na teritoriji grada Pančeva koncentraciju čađi 9 u vazduha iznad dozvoljene granične vrednosti u 13,4% slučajeva. Koncentracija suspendovanih čestica PM10 u vazduhu bila je u 30,5% iznada granične vrednosti, dok je u 9 uzoraka koncentracija benzopirena bila rizična po zdravlje stanovništva. U radu je pokazana direktna i egzaktna povezanost rezultata retrospektivne kliničke studije uticaja aeroalergena na razvoj alergijskog rinitisa sa fizičkim merenjem aerozagađenja na određenoj teritoriji, u ovom slučaju grada Pančeva. Budući radovi iz ove oblasti bi trebalo da sadrže kako kliničke, tako i ekološke parametre.

Ključne reči: aerozagađenje, aeroalergeni, genetski faktori, alergijski rinitis, multifaktorijalni model.

IMPORTANCE OF AIR POLLUTION IN THE MULTIFACTORIAL MODEL OF ALLERGIC RHINITIS

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Besides genetic factors, environmental factors such as air pollution play a significant role in the development of allergic rhinitis as a multifactorial disease. The World Health Organization has drawn attention to the necessity of continually monitoring pollen particles suspended in air due to multifactorial etiopathogenesis of allergic rhinitis while the Law on Air Protection in Serbia characterizes pollen as an air pollutant emitted from natural sources with potential harmful effects on population's health. This work presents a correlation of the results of a retrospective clinical study conducted on a sample of 352 participants in the Department for Otorhinolaryngology at the General Hospital Pančevo and the air pollution results with the pollination calendar of the Institute for Public Health Pančevo containing 729 samples from the 2015-2016 period. The 24-hour soot concentration was measured using the reflexometry method and a selective two-channel analysis, while the concentration of suspended particulates PM10 was measured every third day. Absolute and relative numbers were used for the statistical data analysis in the retrospective clinical study as well as the Chi-squared test and the measures of central tendency and dispersion. Out of 352 patients having taken the SPT-test, 154 tested positives to inhalant allergens. The most frequent sensitization to inhalant allergens was to *Dermatophag.pter* 40.2%, *to Ambrosia elat*. (from weed pollens) 28.5%, to *Lolium p. Dactylis. glom*. (from grass pollens) 27.2%, and to *Betula veru*. (from tree pollens) 12.3%. The air pollution measurement showed that the soot concentration in ambient air was over the permissible limit value in 13.4% cases out of 729 monitoring stations in the territory of the city of Pančevo. The suspended particulate matter PM10 concentration in air exceeded the limit value in 30.5% while a concentration of benzopyrene was over the health risk level in 9 samples. The work shows a direct and exact relation between the results of the retrospective clinical study on the influence of inhalant allergens on the development of allergic rhinitis and the physical measurements of air pollution in a particular territory, in this case the city of Pančevo. Future work in this area should include both clinical and ecological parameters.

Keywords: air pollution, inhalant allergens, genetic factors, allergic rhinitis, multifactorial model.

PRIKAZ PROMENA VEGETACIJE NAKON POŽARA U SRP DELIBLATSKA PEŠČARA KORIŠĆENJEM TEHNIKA DALJINSKE DETEKCIJE

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Apstrakt: Na putu ka Četvrtoj industrijskoj revoluciji, brisanju granica i integrisanju informacionih tehnologija u sve sfere života, ne sme se zaboraviti potreba konstantne zaštite zdrave životne sredine. Monitoring je na prvom mestu, kao najefikasnija preventivna mera. Jedna od najsavremenijih tehnika praćenja stanja i promena životne sredine je upotreba satelita i daljinske detekcije. U tom smislu, na primeru pojave divljih požara, koji se smatraju velikim uzročnicima degradacije prirodnih staništa, promena u atmosferi, zemljištu, živom svetu i ekonomiji, ističemo prednosti kvantifikacije promena pogođenog zaštićenog područja u SRP Deliblatska peščara, prikazom promena vegetacijskog pokrivača tehnikama daljinske detekcije. Uzimajući u obzir vreme i troškove terenskih istraživanja, kao i da se požari šire u velikom vremenskom i prostornom, često nedostupnom, rasponu, daljinsko istraživanje je odlična alternativa za procenu jačine i težine uticaja požara, stanja ekosistema i kvantifikacije štete, modelovanja i procene dinamike nakon požara i kao alat za definisanje strategije i nadgledanja obnavljanja vegetacije u zaštićenim područjima.

Ključne reči: požar, daljinska detekcija, mapiranje, dNBR indeks, vegetacijski pokrivač.

REVIEW OF VEGETATION CHANGES AFTER FIRE IN SNR DELIBLATO SANDS USING REMOTE SENSING TECHNIQUE

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On the way to the Fourth Industrial Revolution, erasing borders and integrating information technology into all spheres of life, we must not forget the need for constant protection of a healthy environment. Monitoring comes first, as the most effective preventive measure. One of the latest techniques for monitoring conditions and environmental changes is the use of satellites and remote sensing. In this regard, by the example of the occurrence of wild fires, which are considered to be major causes of degradation of natural habitats, changes in the atmosphere, soil, living beings and economy, we emphasize the advantages of quantifying the changes of the affected protected area in the SRP Deliblatska Sands, by showing the changes of vegetation cover by remote sensing techniques. Considering the time and cost of field research, as well as the spread of fires across a large temporal and spatial, often inaccessible, range, remote sensing is an excellent alternative for assessing the severity and severity of fire impacts, ecosystem status and quantification of damage, modeling and dynamics assessment after fire, and as a tool for defining strategy and monitoring vegetation restoration in protected areas.

Keywords: fire, remote sensing, mapping, dNBR index, vegetation cover.

DOPRINOS BIOTEHNOLOGIJA ZAŠTITI ZEMLJIŠTA OD ZAGAĐENJA

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Kao jedan od eko-medijuma, zemljište je naročito izloženo prekomernom zagađenju usled dejstva negativnih antropogenih faktora (pre svega tehnogenih uticaja), što dovodi do njegove degradacije, koja se negativno odražava kako na stanje životne sredine tako i na zdravlje ljudi. Istovremeno, razvoj biotehnologija, kao jednog od dostignuća četvrte industrijske revolucije, omogućava da se putem takozvanih bioremediacionih procesa zemljište u određenim slučajevima prečisti od zagađujućih materija i vrati u prvobitno stanje. Imajući u vidu rastuću primenu biotehnologija u zaštiti životne sredine uopšte, a posebno zemljišta, autori u ovom radu razmatraju pojam, primenu i domašaj bioremediacionih procesa u zaštiti zemljišta od zagađenja sa različitih aspekata - počevši od pravnog definisanja ovih procesa i njihovog domašaja, preko primera njihove praktične primene u navedenom kontekstu, uz preporuke za buduće postupanje kako bi se stanje u ovoj oblasti u našoj zemlji unapredilo.

Ključne reči: biotehnologije, bioremediacioni procesi, životna sredina, zagađenje, zemljište

THE CONTRIBUTIN OF BIOTECHNOLOGIES TO THE PROTECTION OF SOIL FROM POLLUTION

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As one of eco-mediums, soil is particularly exposed to excessive pollution due to the effects of negative anthropogenic factors (primarily technological influences), which leads to its degradation that has negative impacts on the condition of the environment as well as on human health. At the same time, the development of biotechnologies, as one of the achievements of the fourth industrial revolution, in some cases facilitates the cleansing of soil from pollutants and its return to normal state through the so-called bioremediation processes. Having in mind the rising application of biotechnologies in environmental protection in general, particularly when it comes to soil, the authors of this paper discuss the term, application and scope of bioremediation processes in the protection of soil from pollution, from various perspectives - starting from the legal definition of these processes and their reach, followed by the examples of their practical application in the aforementioned context and accompanied by recommendations for future actions in order to improve the state in this field in our country.

Keywords: biotechnologies, bioremediation processes, environment, pollution, soil

Sekcija 5

FINANSIRANJE ZAŠTITE ŽIVOTNE SREDINE

Section 5

FINANCING ENVIRONMENTAL PROTECTION

INVESTICIONI CILJEVI U SISTEMU ZAŠTITE ŽIVOTNE SREDINE U REPUBLICI SRBIJI

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Investicije u zaštitu životne sredine u Srbiji predstavljaju obavezu koja je definisana poglavljem 27 na putu u članstvo Srbije u EU. U skladu sa tim doneti su i odgovarajući dokumenti, programi i strategije kojima su određeni investicioni ciljevi. Analiza finansiranja ovih ciljeva pokazuje da ne postoji doslednost u ostvarivanju pripriteta kao ni doslednost u strukturi finansiranja ciljeva. Najznačajnije investicije, do 2016. su bile investicije u zaštitu vazduha, da bi se u 2017. i 2018. prioriteti promenili i investiranje se usmerilo na upravljanje otpadom. Upravljanje otpadnim vodama je bilo na trećem mestu po intenzitetu finansiranja. Ozbiljne države pitanje finansiranja zaštite životne sredine postavljaju kao prioritetno, i u zavisnosti od privrednog rasta i razvoja nameću pitanje investicaja u industrijske tehnologije koji smanjuju zagađenje životne sredine. Problem većini zemalja koje su u tranziciji predstavljaju ove investicije.

Ključne reči: investicije, vazduh, otpad, otpadne vode.

INVESTMENT GOALS IN THE ENVIRONMENTAL PROTECTION SYSTEM IN THE REPUBLIC OF SERBIA

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Investments in environmental protection in Serbia represent an obligation defined by Chapter 27 on the road to Serbia's EU membership. Accordingly, appropriate documents, programs and strategies have been adopted that set investment goals. The analysis of the financing of these goals shows that there is no consistency in achieving the priorities or consistency in the structure of the financing of the goals. The most significant investments, until 2016, were investments in air protection, in order to change the priorities in 2017. and 2018. and to focus on waste management. Wastewater management ranked third in terms of funding intensity. Serious countries raise the issue of environmental financing as a priority and, depending on economic growth and development, raise the issue of investment in industrial technologies that reduce environmental pollution. The problem for most countries in transition is these investments.

Keywords: investments, air, waste, waste water.

TRŽIŠTE ZELENIH OBVEZNICA: INOVATIVNI PRISTUP FINANSIRANJA ODRŽIVE EKONOMIJE ZA ZEMLJE U RAZVOJU

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U radu se analiziraju zelene obveznice kao izvori finansiranja zelenih projekata i razmatra mogućnost razvoja tržišta u zemljama u razvoju. Činjenica je da su zelene obveznice relativno novi oblik finansiranja, ali zahvaljujući povećanju ekološke svesti investitora, poslednjih godina njihovo tržište beleži enormni rast. Međutim, rast tržišta zelenih obveznica u zemljama u razvoju i dalje je u početnoj fazi. Cilj teorijskog pristupa tržištu zelenih obveznica je identifikacija ključnih aktera za razvoj i barijera koje sprečavaju zemlje u razvoju da iskoriste ovaj novi izvor finansiranja održive ekonomije. Nedostatak odgovarajućih institucionalnih aranžmana za upravljanje zelenim obveznicama, izdavanje minimalne veličine i visoki troškovi transakcija su ključne prepreke razvoju ovog tržišta u zemljama u razvoju. Da bi se izborili sa izazovima, ovaj rad predlaže upotrebu multilateralnih i nacionalnih razvojnih banaka kao posredničkih institucija za lokalno upravljanje zelenim obveznicama. Za bolje razumevanje zelenih obveznica, u radu je dat osnovni teorijski princip primene zelenih finansija.

Ključne reči: zelene finansije, tržište zelenih obveznica, održiva ekonomija, zemlje u razvoju.

THE GREEN BONDS MARKET: AN INNOVATIVE APPROACH TO FINANCING SUSTAINABLE ECONOMY FOR DEVELOPING COUNTRIES

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The paper analyses green bonds as sources of financing green projects and discusses the possibility of developing market in developing countries. Green bonds are a relatively new form of financing and thanks to increased investors' climate awareness, the market has seen an enormous growth in the last years. However, the growth of green bond market in developing countries is still in its initial phase. The goal of the theoretical approach to green bond market is to identify the key actors for the development and barriers that prevent the developing countries from taking advantage of this growing source of financing sustainable economy. The lack of appropriate institutional arrangements for managing green bonds, issuing a minimum volume and high transaction costs are the key obstacles to the development of this market in developing countries. In order to cope with challenges, this paper proposes an use of multilateral and national development banks as intermediary institutions for local green bond management. For a better understanding of green bonds, the paper provides a basic theoretical background of green finance.

Keywords: green finance, green bond market, sustainable economy, developing countries.

ULOGA I ZNAČAJ INTERNE REVIZIJE ZA UNAPREĐENJE KORPORATIVNOG UPRAVLJANJA

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Autori u ovom naučnom radu analiziraju na koji način interna revizija može biti iskorišćena u svrhu unapređenja korporativnog upravljanja. Korporativno upravljanje predstavlja uspostavljanje sistema zasnovanog na poštovanju odgovarajućih poslovnih principa i pravila organizacije u svrhu obezbeđivanja definisanih okvira upravljanja, ovlašćenja i nadzora prema menadžmentu. U okviru ovog procesa postoje pravila i procedure koje je potrebno primenjivati prilikom donošenja odluka kako bi se postigli ciljevi koje je poslovni subjekt unapred postavio. Ono utiče na celokupan ciklus poslovanja i zbog toga mu je potrebno pristupiti sa posebnom pažnjom. U svrhu unapređenja korporativnog upravljanja potrebno je uključiti i internu reviziju čiji je zadatak da doda vrednost na način što će da pomogne organizaciji da pruži pomoć preduzećima prilikom ostvarivanja njihovih ciljeva kroz procenu delotvornosti upravljanja rizicima, kontrole i korporativnog upravljanja. Njen značaj u korporativnom upravljanju se ispoljava kroz njene 4 funkcije, misleći pri tome na: pružanje podrške efikasnom upravljanju rizikom u poslovnom entitetu; uveravanje o adekvatno uspostavljenom sistemu internih kontrola u preduzeću; pružanje podrške u obezbeđivanju poštovanja zakona i propisa i preuzimanje aktivnije uloge u pružanju podrške etičkom kodeksu poslovnog subjekta. U radu je na praktičnom primeru prikazano kako interna revizija može da utiče na podizanje finansijske i poslovne discipline odnosno na unapređenje i optimizaciju poslovanja odnosno postizanja pozitivnih efekata u poslovanju akcionarskog društva koje je obuhvaćeno istraživanjem.

Ključne reči: korporativno upravljanje, korporacija, efikasno upravljanje, interna revizija, interne kontrole, rizici.

THE ROLE AND IMPORTANCE OF INTERNAL AUDIT FOR IMPROVEMENT CORPORATE GOVERNANCE

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In this scientific paper, the authors analyze how internal audit can be used to improve corporate governance. Corporate governance is a complex process that requires a lot of effort and effort in order to provide management, authority and supervision to management. Within this process, there are rules and procedures that need to be applied when making decisions in order to achieve the goals set in advance by the business entity. It affects the entire business cycle and therefore needs to be approached with special care. In order to improve corporate governance, it is necessary to include internal audit whose task is to help the organization to assist companies in achieving their goals through the assessment of the effectiveness of risk management, control and corporate governance. Its importance in corporate governance is manifested through its 4 functions, referring to: providing support for effective risk management in the business entity; assurance of an adequately established system of internal controls in the company; providing support in ensuring compliance with laws and regulations and taking a more active role in providing support to the business entity's code of ethics. The paper presents a practical example of how internal audit can affect the raising of financial and business discipline, ie the improvement and optimization of operations, ie the achievement of positive effects in the operations of a joint stock company covered by the research.

Keywords: corporate governance, corporation, efficient management, internal audit, internal controls, risk.

EKOLOŠKI POREZI U FUNKCIJI ZAŠTITE ŽIVOTNE SREDINE REPUBLIKE SRBIJE

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Ekološki porezi postaju standard u poreskim sistemima u zemljama gde je kultura zaštite životne sredine razvijena do neophodnosti preduzimanja organizovanih aktivnosti u ovoj oblasti. Ekološki porezi su element poreskog sistema u Srbiji. Prihodi od ove vrste proizvoda predstavljaju značajan instrument kontrole zagađenja i upravljanja prirodnim resursima. Najveće poresko opterećenje trpe najznačajniji zagađivači i to u oblasti energetike. Daleko manje ali značajno opterećenje trpe oni koji imaju veze sa vlasništvom nad motornim vozilima, a najmanje opterećenje trpe obveznici obuhvaćeni porezom na zagađenje i na korišćenje prirodnih resursa. Potrošnju koja utiče na ugrožavanje životne sredine imaju za cilj da pogode ekološki porezi. Stalno rastući prihodi od poreza u oblasti zaštite životne sredine imaju punu opravdanost, imajući u vidu da su ekološki problem sve više u fokusu ne samo države i naučne zajednice već i stanovništva. Analiza metodom linearnog trenda pokazala je pozitivan smer, a prognoza daljeg kretanja poreskih opterećenja u naredne dve godine u odnosu na zadnju analiziranu godinu pokazuje trend povećanja.

Ključne reči: porezi, poresko opterećenje, ukupni porezi, prihodi od poreza.

ENVIRONMENTAL TAXES IN THE FUNCTION OF ENVIRONMENTAL PROTECTION OF THE REPUBLIC OF SERBIA

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Environmental taxes are becoming a standard in tax systems in countries where an environmental culture is developed to the necessity of undertaking organized activities in this field. Environmental taxes are an element of the tax system in Serbia. Product type revenue is a significant instrument for pollution control and natural resource management. The biggest tax burden is suffered by the most significant pollutants in the field of energy. Far fewer but significant burdens are suffered by those who have to do with motor vehicle ownership, and the taxpayers covered by the tax on pollution and on the use of natural resources suffer the burden. Consumption that affects environmental hazards is meant to be driven by environmental taxes. The ever-increasing environmental tax revenues are fully justified, bearing in mind that the environmental problem is increasingly the focus of not only the state and the scientific community, but also the population. The linear trend analysis showed a positive trend, and the forecast of further movement of tax burdens in the next two years compared to the last analyzed year shows an increasing trend.

Key words: taxes, tax burden, total taxes, tax revenue.

STRES TESTOVI U FUNKCIJI PROCENE KREDITNOG RIZIKA U BANKARSKOM SEKTORU

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Odmeravanje kreditnog rizika predstavlja važnu kariku u savremenim uslovima bankarskog poslovanja. Kako kreditni plasmani čine glavnu oblast bankarskog poslovanja, za kreditni rizik se može reći da predstavlja najvažniji rizik koji je prisutan u bankarskom poslovanju. Usled stalnih promena na bankarskom tržištu, kao i u samoj internoj organizaciji poslovanja banaka, kao i sve intenzivnijeg procesa globalizacije, upravljanje kreditnim rizikom postaje sve značajnija aktivnost kojoj banke sve više poklanjaju pažnju. Kako rizik nije moguće izbeći u potpunosti, potrebno ga je identifikovati, izvršiti što precizniju procenu i doneti odluku o postupanju sa rizikom. Samim tim, procena rizika predstavlja osnovni proces aktivnosti upravljanja rizikom. Zato je potrebno pronaći adekvatne metode za identifikaciju, procenu i obračun rizika. Za očuvanje finansijske stabilnosti široko je rasprostranjeno testiranje otpornosti na stres, koje analizira mogućnosti pojedinih banaka ili celokupnog bankarskog sistema u cilju apsorbovanja rizika. Autori u radu prikazuju rezultate stres testova u bankarskom sektoru Sjedinjenih Američkih Država i zemalja Evropske Unije u uslovima svetske ekonomske krize kada ovaj alat dobija na značaju i važnosti u krugovima međunarodnih finansijskih institucija. Osnovni cilj koji se želi postići procenom rizika je da se blagovremeno identifikuju sve vrste rizika kojima su banke izložene, izvrši njihova procena i predvide njihove negativne posledice po poslovanje. Zato se posebna pažnja posvećuje razvoju i implementaciji metoda i modela procene rizika. Njihov razvoj i primena dobijaju sve više na značaju s pojavom Bazelskih standarda koji propisuju obavezu bankama da vrše obračun i procenu rizika, kao i da efikasno upravljaju kreditnim rizikom.

Ključne reči: rizik, upravljanje rizikom, procena rizika, stres test, ekonomska kriza

STRESS TESTS IN THE FUNCTION OF CREDIT RISK ASSESSMENT IN THE BANKING SECTOR

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Credit risk measurement is an important link in modern banking conditions. Having in mind that credit placements are a major area of banking business, credit risk is the most important risk in banking sector. Due to the constant changes in the banking market, in the internal organization of bank operations, as well as the increasing process of globalization, credit risk management is becoming an increasingly important activity for banks. As the risk cannot be completely avoided, it needs to be identified, estimated accurately and defined by risk management. Therefore, risk assessment is the basic process of risk management activities. It is therefore necessary to find adequate methods for the identification, assessment and valuation of risks. A method widely used for the purpose of preserving financial stability is testing resilience to stress, which analysis the possibility of bank or the overall banking system, in terms of absorbing various types of risks. Authors present the results of stress tests in the banking sector of the United States and European Union countries in the context of the global economic crisis when this tool gains in the importance with international financial institutions. The main objective of the risk assessment is to identify all types of risks to which banks are exposed, to carry out their assessment and to anticipate their negative effects on business. Therefore, particular attention is given to the development and implementation of risk assessment methods and models. Their development and implementation are becoming increasingly important with the advent of the Basel Accords, which prescribe the obligation for banks to calculate and assess risk, as well as to effectively manage credit risk.

Keywords: risk, risk management, risk assessment, stress testing, economic crisis.

UTICAJ KLIMATAKIH PROMENA NA EKO-TROŠKOVE PROIZVODNJE ZELENOG GORIVA

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Uticaj klimatskih promena na ekološke troškove proizvodnje biogoriva, može se poistovetiti sa globalnim zagrevanjem. Imajući u vidu da je zemljina atmosfera sastavljena od gasova i vodene pare, od čega su azot i kiseonik nazastupljeniji, dok je ugljen-dioksid prisutan u atmosferi u veoma malim količinama. Međutim, uloga ugljen-dioksida u našoj atmosferi jeste da reguliše temperaturu površine naše planete sa efektom staklene bašte, što je od velikog značaja za život. U slučaju spaljivanja fosilnih goriva, naglo se povećava količina ugljenika koji se oslobađa u atmosferu, što dovodi do narušavanja eko-ravnoteže. Zbog toga je važno izmeniti stil života na planeti zemlji uz značajno povećanje energetske i ekološke efikasnosti, uz pronalaženje novih prirodnih resursa i korišćenje tehnologije iz obnovljivih izvora energije. U tu svrhu, u radu ćemo se posluži analizom uticaja ekoloških troškova proizvodnje i prerade biogoriva uz primenu naprednih tehnologija. Važno je primeniti strategiju održivog razvoja, gde vrednost dolazi od činjenice da je nešto stvoreno prirodnim procesom sa visokim stepenom biodiverziteta, poput zelenog goriva. Ako se uticaj klimatskih promena ignoriše, dolazi do problema sa životnom sredinom što vodi dodatnim eksternim troškovima i investicijama u proizvodnji biogoriva, čemu se u radu posvećuje najveća pažnja.

Key words: klimatske promene, biogoriva, ekološki troškovi, obnovljive tehnologije.

THE IMPACT OF CLIMATE CHANGES ON THE ECO-COSTS OF GREEN FUEL PRODUCTION

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The impact of climate change on the environmental costs of biofuel production can be identified with global warming. Bearing in mind that the Earth's atmosphere is composed of gases and water vapor, of which nitrogen and oxygen are more prevalent, while carbon dioxide is present in the atmosphere in very small quantities. However, the role of carbon dioxide in our atmosphere is to regulate the surface temperature of our planet with a greenhouse effect, which is of great importance for life. In the case of fossil fuel combustion, the amount of carbon released into the atmosphere increases sharply, causing eco-balance to be disturbed. Therefore, it is important to change the lifestyle on planet earth with a significant increase in energy and eco-efficiency while finding new natural resources and using technology from renewable energy sources. To this end, the paper will analyze the impact of the environmental costs of biofuel production and processing using advanced technologies. It is important to implement a sustainable development strategy where the value comes from the fact that something is created by a natural process with a high degree of biodiversity, such as green fuel. If the impact of climate change is ignored, there are environmental problems leading to additional external costs and investment in biofuel production, which is given the highest attention in this paper.

Key words: climate changes, biofuels, environmental costs, renewable technologies.

PRIVREDNO-EKONOMSKA SPREMNOST REPUBLIKE SRBIJE ZA SUBVENISANJE LICA NA KUPOVINU PUTNIČKIH MOTORNIH VOZILA NA ELEKTRIČNI POGON: PREDNOSTI I NEDOSTACI

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Život današnjice je nezamisliv bez upotrebe putničkih motornih vozila. Skoro svako domačinstvo poseduje minimalno jedno putničko motorno vozilo . Koliko je upotreba istih olakašala svakodnevnicu, toliko je i ugrozila životnu sredinu (tako ispuštanjem iz auspuha putničkih motornih vozila ugljen-monoksid, ugljovodonike, azot-oksid, čađ, kao i sitne čestice u vazduhu glavni su uzrok smoga i respitaornih bolesti ljudi). Imajući u vidu utvrđen visok stepen zagađenosti vazduha koji potiče od saobraćaja, a u nameri unapređenja kvaliteta vazduha, Vlada Republike Srbije je donela Uredbu o uslovima i načinu sprovođenja subvencionisane kupovine novih vozila isključivo na električni pogon, kao i vozila koja uz motor sa unutrašnjim sagorevanjem pokreće i električni pogon (hibridni pogon) što predstavlja i predmet analize rada. Cilj rada predstavlja sagledavanje prednosti i nedostataka upotrebe putničkih motonih vozila na električni pogon u kontekstu kupovne moći građana Republike Srbije i uz ograničene subvencije koje država daje na jednoj strani (privredno-ekonomska moć države) i smanjenja zagađenosti životne sredine, odnosno vazduha, na drugoj.

Ključne reči: putničko motorno vozilo na električni pogon, subvencije, Srbija.

ECONOMIC READINESS OF THE REPUBLIC OF SERBIA TO FINANCE SUBVENTIONS FOR THE PURCHASE OF ELECTRIC PASSENGER CARS: ADVANTAGES AND DISADVANTAGES

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Life today is unthinkable without the use of passenger motor vehicles. Almost every household owns at least one passenger motor vehicle. That has made everyday life easier, but it has also endangered the environment (thus the exhaust from the exhaust of passenger motor vehicles, carbon monoxide, hydrocarbons, nitrous oxide, soot, as well as small particles in the air are the main causes of smog and respiratory diseases in humans). Bearing in mind the high level of air pollution originating from traffic, and with the aim of improving the quality of air, the Government of the Republic of Serbia has adopted the Decree on the conditions and manner of conducting subsidized purchase of new electric vehicles, as well as vehicles that, with the internal combustion engine, electric drive (hybrid drive) which is also the subject of work analysis. The aim of this paper is to look at the advantages and disadvantages of using electric powered electric motor vehicles in the context of the purchasing power of the citizens of the Republic of Serbia and with limited subsidies provided by the state on the one hand (economic and economic power of the state) and reduction of environmental or air pollution on the other.

Keywords: electric vehicle, subvention, Republic of Serbia.

ULOGA I ZNAČAJ REVIZIJA ZA ODRŽIVI RAZVOJ

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Autori polaze od hipoteza da koncept održivog razvoja povezuje ekonomsku, socijalnu i ekološku dimenziju rasta i razvoja. Smatraju da održivi razvoj počiva na principu međugeneracijske pravičnosti i jednake raspodele mogućnosti između sadašnjih i budućih generacija. Primenjen na poslovanje kompanija, dovodi do stvaranja društveno odgovornih kompanija, kod kojih glavni cilj poslovanja nije samo maksimizacija profita, već i zaštita i očuvanje životne sredine. Ostvarenje ovih ciljeva zavisi od stalnog praćenja i izveštavanja o ekonomskim, socijalnim i ekološkim performansama. Važnu ulogu u ostvarenju održivog rasta i razvoja ima uspostavljanje adekvatnog sistema internih kontrola u kompaniji, adekvatno i kvalitetno organizovanje računovodstva, organizovanje aktivnosti interne revizije kao i angažovanje eksternog revizora radi vršenja nezavisne revizije. Aktivnosti eksternih i internih revizora treba da dodaju vrednost unapređenju sistema izveštavanja i podizanje njegovog kredibiliteta kao i samih izveštaja o poslovanju kompanije. U radu autori jasno ukazuju da korporativna socijalna odgovornost je u samoj osnovi poslovanja, što znači da se kompanije pozivaju na odgovornost za sve negativne uticaje njihovog poslovanja. S druge strane, organizovanje interne revizije i angažovanje nezavisnog revizora doprinosi ostvarenju ciljeva održivog rasta i razvoja u dugom roku, jer se uz pomoć njih mogu prepoznati područja u kojima su neophodna unapređenja. Ona povećava kredibilitet i transparentnost poslovanja, kao i poverenje menadžmenta i stakeholder-a.

Ključne reči: održivi razvoj, društvena odgovornost, zaštita životne sredine, izveštavanje o održivosti, interna kontrola, revizija, interna i nezavisna revizija.

THE ROLE AND IMPORTANCE OF AUDITS FOR SUSTAINABLE DEVELOPMENT

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The authors start from the hypothesis that the concept of sustainable development connects the economic, social and environmental dimensions of growth and development. It is based on the principle of intergenerational fairness and equal distribution of opportunity between present and future generations. Applied to the business of companies, it leads to the creation of socially responsible companies, where the main objective of the business is not only profit maximization, but also the protection and preservation of the environment. Achieving these goals depends on constant monitoring and reporting of economic, social and environmental performance. Accounting and auditing play an important role in supporting sustainable growth and development. The primary role of accounting is measurement and reporting of business performance in the form of economic, social and environmental indicators. The authors make it clear that corporate social responsibility is at the core of business, which means that companies are responsible for all negative impacts of their business. On the other hand, the audit contributes to the achievement of sustainable growth and development goals in the long run, as it can identify areas where improvements. It enhances the credibility and transparency of the business, as well as the confidence of the management and stakeholders.

Keywords: sustainable development, social responsibility, environmental protection, sustainability reporting, internal and external audit.

TROŠKOVI U FUNKCIJI UPRAVLJANJA SISTEMOM ZAŠTITE ŽIVOTNE SREDINE

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Troškovi za zaštitu životne sredine su između ostalog i finansijski pokazatelj koji ukazuje na to kolika se pažnja posvećuje ovoj sve važnijoj životnoj i ekonomskoj aktivnosti. Upravljanje ovim troškovima je istovremeno i znak koliko je efikasno finansijsko upravljanje sistemom zaštite životne sredine. Tekući izdaci u strukturi troškova daleko nadmašuju investicije u zaštitu životne sredine, a aktivnost upravljanja otpadom je daleko najzastupljenija u finansiranju svih aktivnosti koje su u vezi sa zaštitom životne sredine. Nacionalni program zaštite životne sredine u kome su projektovani finansijski elementi se ne ostvaruje ni po iznosima ni po strukturi. Troškovi zaštite životne sredine predstavljaju namenu trošenja sredstava obezbeđenih ekonomskim instrumentima. Troškovi nastali radi sprečavanja, smanjenja i uklanjanja zagađenja ili bilo koje druge degradacije životne sredine usled procesa proizvodnje ili upotrebe dobara i usluga su troškovi za zaštitu životne sredine. Efikasno upravljanje sistemom zaštite životne sredine znači i efikasno upravljanje ovim troškovima i usmeravanje izvora finansiranja na ove troškove.

Ključne reči: troškovi, tekući izdaci, investicije, životna sredina, zaštita životne sredine, nacionalni program, Srbija.

COSTS IN THE FUNCTION OF MANAGING THE ENVIRONMENTAL PROTECTION SYSTEM

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Environmental costs are, among other things, a financial indicator indicating how much attention is being paid to this increasingly important life and economic activity. Managing these costs is also a sign of how effective the financial management of the environmental system is. Running costs in the cost structure far outweighs environmental investment, and waste management activity is by far the most represented in financing all environmental activities. A national environmental program in which financial elements are designed is not realized either in terms of amount or structure. Environmental costs are the purpose of spending the funds provided by economic instruments. Costs incurred to prevent, reduce and eliminate pollution or any other environmental degradation due to the process of production or use of goods and services are environmental costs. Effective management of the environmental system also means the efficient management of these costs and the directing of funding sources to these costs.

Keywords: costs, running costs, investments, environment, environmental protection, national program, Serbia.

UTICAJ FAKTORA STRATEŠKOG RIZIKA NA ODRŽIVO BANKARSTVO

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U ovom radu autori razmatraju pitanja strateškog rizika sa fokusom na različite faktore koji izazivaju, odnosno utiču na strateški rizik u bankarskom sektoru. Odabrana metodologija ovog rada je selektivni pregled literature objavljenih članaka, studija i različitih izveštaja. Iz ovog razloga, rad daje teoretski okvir fokusirajući se na najpregledanije publikacije u proteklom periodu, napisane na temu strateškog rizika, kao i na temu faktora koji utiču na strateški rizik u bankarskom sektoru. Autori ističu da je potrebno napomenuti da u smislu rezultata ovaj rad pokazuje nedostatak naučnog fonda u istraživanju problema faktora poslovnog rizika u aktuelnoj literaturi. Predlažu da naučni odbori u rangiranim časopisima i publikacijama više pažnje posvete ovom važnom problemu savremenog bankarstva.Autori ukazuju da održivo bankarstvo zahteva da se popune uočene praznine u naučnom fondu kroz intenziviranje budućih istraživanja.

Ključne reči: strateški rizik, bankarstvo, faktori, bankarski sektor, pregled literature.

INFLUENCE OF STRATEGIC RISK FACTORS ON SUSTAINABLE BANKING

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In this paper, the authors discuss issues of strategic risk with a focus on various factors that cause or influence strategic risk in the banking sector. Furthermore, the chosen methodology of this paper is a selective literature review of the published articles, studies, and different reports. For this reason, this paper provides a theoretical frame while focusing on the most reviewed publications written on the subject in the recent period. The authors point out that in terms of results, this paper demonstrates the lack of a scientific foundation in investigating the problem of business risk factors in the current literature. They suggest that scientific committees in ranked journals and publications pay more attention to this important problem of contemporary banking. The authors indicate that sustainable banking requires filling the perceived gaps in the science fund through intensifying future research.

Keywords: strategic risk, banking, factors, banking sector, literature review.

PRIMENA BLOCKCHAINA U POSLOVANJU SA OBNOVLJIVIM IZVORIMA ENERGIJE

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Inovativni poslovni modeli javljaju se u svim vrstama delatnosti, utičući na unapređenje poslovnih procesa. Pojava novih tehnologija utiče na promene navika i potreba, kao i na formiranje sistema održivog poslovanja. Četvrta industrijska revolucija donosi nove primene tehnologija - robotike, veštačke inteligencije, interneta stvari, kvantne tehnologije, kao i nove načine skladištenja energije, npr. primenom blockchain tehnologije. Ove tehnološke inovacije kreiraće novi pristup svakodnevnim aktivnostima a takođe poslovnim i privatnim poduhvatima.
U ovom radu je obrađen pojam blockchain tehnologije i njegova primena na primeru projekta koji je osmišljen za skladištenje obnovljive energije i prodaju obnovljivih izvora energije.

Ključne reči: Industrija 4.0, blockchain, obnovljivi izvori energije, skladištenje energije.

APPLICATION OF BLOCKCHAIN IN BUSINESS WITH RENEWABLE ENERGY SOURCES

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Innovative business models occur in all types of industries, influencing the improvement of business processes. Occurrence of new technologies influences changes in habits and needs, as well as the formation of a sustainable business system. The fourth industrial revolution is bringing new ways of technology from robotics, artificial intelligence, the internet of things, quantum technology, as well as to new ways of storing energy, e.g. using blockchain technology. These technological innovations will create a new approach to everyday activities, both business and private.
This paper will cover the concept of blockchain technology and its application to an example project designed to store and sell renewable energy.

Key words: Industry 4.0, blockchain, renewable energy, energy storage.

UTICAJ MODELA KORPORATIVNOG UPRAVLJANJA NA ODRŽIVI RAZVOJ KORPORACIJA

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Prema navodima autora adekvatno korporativno upravljanje je preduslov održivom razvoju preduzeća jer poboljšava operativnu efikasnost, omogućava lakši pristup tržištima kapitala i boljoj tržišnoj poziciji, pruža i stvara povoljnije uslove za prikupljanje novog kapitala, obezbeđuje veću vrednost sredstava i stvara bolju reputaciju preduzeća. Zbog toga je veoma važno izvršiti izbor odgovarajućeg modela korporativnog upravljanja koji će biti prilagođen geografskom području u kom preduzeće posluje i prilikama i problemima sa kojima se suočava. Razlikuju se tri modela korporativnog upravljanja i to: angloamerički, japanski i nemački model. Svaki od navedenih modela ima bitna svojstva koja ga razlikuju od drugih modela. MPP "Jedinstvo" ad Sevojno primenjuje dvodomni sistem korporativnog upravljanja koji po svojim karakteristikama podseća na nemački model korporativnog upravljanja. Primena odgovarajućeg modela korporativnog upravljanja MPP "Jedinstvo" ad, Sevojno govori nam da Manadžment preduzeća u poslednjim godinama radi na podizanju poslovnih performansi i učešća na tržištu, što je vidljivo kroz podizanje poslovnih prihoda, raščišćavanjem internih odnosa u grupi, pojačavanjem naplate svojih potraživanja a time i postizanja bolje likvidnosti i teži da procenom i vrednovanjem dovede vrednost imovine na realnu vrednost i da obezbedi utrživu i konkurentnu poziciju na tržištu za svoje proizvode.

Ključne reči: korporacija, korporativno upravljanje, modeli korporativnog upravljanja, održivi razvoj.

THE IMPACT OF CORPORATE GOVERNANCE MODELS OF SUSTAINABLE DEVELOPMENT CORPORATIONS

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Authors of the paper note adequate corporate governance is a prerequisite for sustainable development of the company because it improves operational efficiency, allows easier access to capital markets and better market position, provides and creates more favorable conditions for raising new capital and provides greater value and creates a better reputation. Therefore, it is very important to choose the appropriate model of corporate governance that will be adapted to the geographical area in which the company operates. There are three models of corporate governance: Anglo-American, Japanese and German. Each of these models has essential features that distinguish it from other models. PPP "Jedinstvo" Sevojno applies a bicameral system of corporate governance, which by its characteristics resembles the German model of corporate governance. The application of the appropriate model of corporate governance has enabled PPP "Jedinstvo", Sevojno in recent years has been working to increase business performance and market share, which is visible through raising business income, reconciliation internal relations in the group between related parties, increasing collection of its receivables and achieving better liquidity and strives to bring the value of assets to real value through assessment and valuation and to ensure a marketable and competitive market position for its products.

Keywords: corporation, corporate governance, corporate governance models, sustainable development.

PERSPEKTIVE FINANSIRANJA ORGANSKOG STOČARSTVA MODELOM BANKARSKOG KREDITA U REPUBLICI SRBIJI

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Ekološka poljoprivreda i stočarstvo sve više su u fokusu poslovnog bankarstva u formatu komercijalnog kreditiranja poljoprivrede. Dva su jasna razloga za to. Prvi, sve rigorozniji pristup regulatora u domenu poljoprivredne proizvodnje koja se formatira u okvire ekologije i održivog razvoja. Drugi, rastuća tražnja za ekološki prihvatljivim proizvodima organskog porekla koja otvara prostor za uvećanje profita agro sektora i komercijalnog bankarstva. Konzervativno stočarstvo u kome dominira proizvodnja junećeg mesa oslonjena u najvećoj meri na uzgoj i proizvodnju rase simental prestaje da bude atraktivano komercijalno-kreditno područje za poslovno bankarstvo. Ekološko stočarstvo u formi organske proizvodnje rase Aberdin Angus opravdava kreditna ulaganja banke sa aspekata profitabilnosti i ispunjenja standarda ekološke prihvatljivosti i održivog razvoja.

Ključne reči: ekološko stočarstvo, organska proizvodnja, održivi razvoj, bankarski kredit, Aberdin Angus bikovi.

PROSPECTS OF FINANCING ORGANIC ANIMAL HUSBANDRY BY BANK LOAN MODEL IN THE REPUBLIC OF SERBIA

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Ecological agriculture and animal husbandry are increasingly in the focus of business banking in the context of commercial lending to agriculture. There are two obvious reasons. The first is the increasingly rigorous approach of the regulator in the field of agricultural production within the framework of ecology and sustainable development. The second reason concerns the rising demand for ecologically acceptable organic products, which opens room for boosting profit of the agricultural sector and commercial banking. Conservative animal husbandry with the dominant production of beef and relying mainly on the breeding and production of the Simmental breed ceases to be an attractive commercial-credit area for business banking. Ecological animal husbandry in the form of organic production of the Aberdeen Angus breed justifies a bank's commercial lending in terms of profitability and fulfilment of standards of ecological acceptability and sustainable development.

Key words: ecological animal husbandry, organic production, sustainable development, bank loan, Aberdeen Angus bulls.

RIZICI FINANSIRANJA KONVENCIONALNOG MODELA PROIZVODNJE MALINE U POSLOVNOM BANKARSTVU REPUBLIKE SRBIJE

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Voćarska kultura maline decenijski predstavlja srpski izvozni proizvod parexelance. Poslovno bankarstvo favorizovalo je ovaj vid voćarske proizvodnje i izvoza u svojim kreditnim politikama i praksi. Tradicionalno je kreditirana intenzivna proizvodnja i uzgoj maline. Posebna ograničenja u pogledu ekoloških zahteva i ispunjenja standarda organski ispravnih proizvoda nisu bili u fokusu poslovnog bankarstva. Trendovi rasta tražnje za organskom hranom i poljoprivrednim proizvodima proizvedenim u ekološki ispravnom ambijentu dominiraju EU i tržištima razvijenih zemalja, ključnim za domicilne proizvođače. Intenzitet trenda diferencira i cene organski proizvedene maline u odnosu na onu koja je proizvedena na tradicionalan način intenzivnom upotrebom pesticida i hemijskih sredstava. Naglašeno viša cena i permanentno rastuća tražnja za organskom malinom usmerila je poslovno bankarstvo da većinu kreditnih fondova usmeri u njenu proizvodnju.

Ključne reči: organska malina, ekološki ambijent, izvozni proizvod, bankarski kredit, rastuća tražnja.

THE RISKS OF FINANCING CONVENTIONALLY GROWN RASPBERRY AND ITS PRODUCTION IN COMMERCIAL BANKING IN THE REPUBLIC OF SERBIA

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Raspberry production has been one of the leading Serbian export brands for decades. Commercial banking has prioritized this type of fruit production and its export in their loan lending. Traditionally, the banks were granting loans for the mass production based on the intensive use of synthetic chemicals. In commercial banking, lending there was no focus on ecological demands nor fulfilling standards for organically grown product. Demanding trends for organically grown food and agricultural products produced in ecological environment dominate the EU and other developed markets that are the target markets for our export. Such a strong trend causes the price difference between the organically grown raspberries and traditionally grown fruit where the chemicals are used. Significantly higher price and a higher demand for the organic raspberry has steered the commercial banking lending towards financing the organically grown raspberries.

Key words: Organic raspberry, ecological environment, export product, banking loans, rising demands.

INVESTICIJE U ZAŠTITU ŽIVOTNE SREDINE I POTREBA ZA IZVEŠTAVANJEM O ZAŠTITI ŽIVOTNE SREDINE KAO DEO DRUŠTVENO ODGOVORNOG POSLOVANJA

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Društveno odgovorno poslovanje, u savremenim uslovima, postalo je neminovnost. Investicije u zaštitu životne sredine postale su uslov opstanka društva ali i uslov opstanka i razvoja samih preduzeća. Oblasti investiranja u zaštitu životne sredine koje su profitabilne trebalo bi da budu predmet privatnih investicija dok bi one oblasti koje ne donose profit trebalo da investicije crpe iz tzv. "Zelenih fondova". U svakom slučaju Republika Srbija zaostaje za Evropom i svetom u pogledu ulaganja u zaštitu životne sredine i kako bi ovo nadoknadila potrebno je da se dosta uloži u promociju zelenih investicija. Kao jedan od načina promocije ovakvog vida investiranja jeste i izveštavanje o društveno odgovornom poslovanju. Iz tog razloga zajedno sa potrebom za investiranjem u zaštitu životne sredine javlja se i potreba za izveštavanjem o zaštiti životne sredine kao i društveno odgovornom poslovanju uopšte.

Ključne reči: zaštita životne sredine, društveno odgovorno poslovanje, investicije, izveštavanje.

ENVIRONMENTAL INVESTMENTS AND NEEDS FOR ENVIRONMENTAL REPORTING AS A PART OF SOCIALLY RESPONSIBLE BUSINESS

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Socially responsible business, in modern conditions, has become an inevitable. Investments in environmental protection have become a condition for the survival of society, but also a condition for the survival and development of the companies themselves. Areas of environmental investment that are profitable should be the subject of private investment, while those areas that are not profitable should draw investments from the so-called Of the Green Funds. In any case, the Republic of Serbia is lagging behind Europe and the world in terms of environmental investments and in order to compensate for this, it is necessary to invest a lot in promoting green investments. One of the ways to promote this type of investment is to report on corporate social responsibility. For this reason, along with the need to invest in environmental protection, there is a need for environmental reporting as well as for corporate social responsibility in general.

Key words: environmental protection, corporate social responsibility, investment, reporting.

ZELENE FINANSIJE I SOCIJALNO ODGOVORNO BANKARSTVO

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Sveobuhvatni pristup društveno odgovornog poslovanja u bankarskom sektoru se zasniva na standardizaciji, implementaciji i kontroli internih i eksternih sistema što za cilj ima uvođenje novih i inovativnih bankarskih proizvoda koji obezbeđuju društveno odgovorno poslovanje i efikasno upravljanje zaštitom životne sredine. U radu je dat prikaz razvoja zelenih finansija sa fokusom na ozelenjavanje bankarstva kroz primere dobre prakse zemalja koje su uspešno implementirale ovaj koncept u svoje poslovne strategije. Autori u radu analiziraju i nivo razvijenosti „zelenog" bankarstva u Srbiji i zaključuju da postoji nekoliko izazova u procesu razvoja pomenutog koncepta: harmonizacija propisa, podizanje svesti o značaju „zelenih" finansija i „zelenog" novca, povećanje nivoa ulaganja u društveno odgovorno poslovanje.

Ključne reči: zelene finansije, zeleno bankarstvo, društvena odgovornost u bankarskom sektoru.

GREEN FINANCE AND SOCIALLY RESPONSIBLE BANKING

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The comprehensive CSR approach in the banking sector is based on the standardization, implementation and control of internal and external systems, which aims to introduce new and innovative banking products that ensure social responsibility and efficient environmental management. The paper presents the development of green finance with a focus on greening banking through examples of countries that have successfully implemented this concept in their business strategies. The authors analyze the level of development in Serbian green banking sector. Furthermore, they conclude that there are several challenges in the developing process: harmonization of regulations, raising awareness of the importance of green finance and green money, increasing the level of investment in the corporate social responsibility.

Keywords: green finance, green banking, social responsibility in banking sector.

Sekcija 6

SOCIJALNE DIMENZIJE I PRAVNI ASPEKTI ČETVRTE INDUSTRIJSKE REVOLUCIJE

Section 6

SOCIAL DIMENSIONS AND LEGAL ASPECTS OF THE FOURTH INDUSTRIAL REVOLUTION

ЧЕТВРТА ИНДУСТРИЈСКА РЕВОЛУЦИЈА, ЗЕЛЕНА ЕКОНОМИЈА И СОЦИЈАЛНЕ ДИМЕНЗИЈЕ ОДРЖИВОГ РАЗВОЈА

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Појам четврте индустријске револуције није финализован али је глобално прихваћен, у бројним научним и стручним радовима и подразумева индустријску револуцију коју карактеришу:

- обједињавање бројних технологија, базираних на снажној компјутеризацији, чак до нивоа вештачке интелигенције, отуда и
- роботизација разноврсних производних процеса, али и
- производни процеси засновани на достигнућима молекуларне биологије и генетике.

Сама четврта индустријска револуција може, али и не мора, да произведе ефекте такозване зелене економије. То јест, како је то документом UNEP-а *A Guidebook to the Green Economy* (2008. г.) јасно речено: Економије која се усаглашава са еколошком политиком, отуда и суочава са: климатским променама, оштећењима озонског слоја, дефорестацијом, те другим еколошким проблемима, али се истовремено оријентише и на идентификовање и разрешавање еколошких и социјалних проблема који могу да се искажу унутар економија држава, тежећи успостављању одрживог развоја, како унутар њих тако и на глобалном нивоу.

У суштини, зелена економија би требало да допринесе позитивним социјалним димензијама одрживог развоја, а правилан приступ елементима четврте индустријске револуције, што значи и политички отуда и правни, пре свега на планетарном нивоу, је један од предуслова овог развоја. Отуда се ми и бавимо кључним елементима социјалних димензија одрживог развоја у оквирима четврте индустријске револуције.

Кључне речи: четврта индустријска револуција, зелена економија, еколошки приступ, одрживи развој, социјалне димензије.

FOURTH INDUSTRIAL REVOLUTION, THE GREEN ECONOMY AND SOCIAL DIMENSIONS OF SUSTAINABLE DEVELOPMENT

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Our work is focused on understanding the relationship between the fourth industrial revolution and the so-called green economy in the light of the social dimension of sustainable development. In addition, although the very concept of the fourth industrial revolution has not been finalized, hence no globally accepted, numerous scientific and professional work includes industrial revolution characterized by:

- integrate numerous technologies, based on a strong computerization, even to the level of artificial intelligence, hence the
- robotics variety of manufacturing processes, but also
- production processes based on the achievements of molecular biology and genetics.

Fourth industrial revolution may, but not necessarily product, green economies effects. That is, how, at the year 2008, UNEP document *A Guidebook to the Green Economy* clearly stated: Economies that are complying with environmental policy, hence: the climatic changes, ozone layer depletion, deforestation, and other problems, but at the same time orienting, identifying and resolving environmental and social problems that can express themselves within the economyes of states, aiming at establishing a sustainable development, both within them and on the global level.

In fact, the green economy should contribute to positive social dimensions of sustainable development and, at the same time, to proper approach to the elements of the fourth industrial revolution, which include adequate political and legal approach. Approach especially on a global level as one of main prerequisites for green, and at the same time, industrial development. Hence we, in our text, deal with key elements of the social dimension of sustainable development within the framework of the fourth industrial revolution.

Keywords: industrial revolution, green economy, ecological approach, sustainable development, social dimensions.

ПРАВНИ ОКВИР ЗАШТИТЕ ЖИВОТНЕ СРЕДИНЕ

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Проблеми деградације животне средине наметнули су потребу заједничког договарања и усклађивања напора свих народа света, имајући у виду да заштита животне средине не познаје границе. Основни објекат међународне заштите је просторно дефинисано окружење, односно онај део планете Земље на којем људска бића могу да опстану. Дакле, животна средина није нека апстракција, већ је реч о животном простору на коме је могуће обезбедити квалитетан живот и здравље садашњим и будућим генерацијама. Да би се очувала, заштитила и унапредила животна средина потребно је разумети начин њеног утицаја на друштво. Отуда, изучавање и спровођење прописа из ове области има за циљ да се побољша квалитет животне средине и постигне рационално коришћење природних ресурса, а самим тим и повољно утиче на живот и здравље људи, имајући у виду да је једно од основних људских права управо право на здраву животну средину. С обзиром на сложеност, специфичност и мултидисциплинарност питања животне средине, рад се бави међународноправним регулисањем заштите животне средине, заштитом животне средине у праву Европске уније и заштитом животне средине у праву Републике Србије.

Кључне речи: право заштите животне средине, климатске промене, природни ресурси, одрживи развој.

THE LEGAL FRAMEWORK FOR ENVIRONMENTAL PROTECTION

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The problems of environmental degradation have imposed the necessity of concerted effort of all countries of the world, considering the fact that environmental protection has no boundaries. The focus of international environmental protection is on definition of environmental area, i.e. the part of the Earth where humans can survive. Therefore, the environment is the area where it is possible to provide quality and healthy life for present and future generations. In order to preserve, protect and improve the environment, it is also necessary to understand how it influences on society. Thus, the study and enforcement of regulations in this field aim to improve the quality of environment, achieve rational use of natural resources and consequently produce positive effect on human health and life. One of the basic human rights is the right to a healthy environment. Considering the complexity and multidisciplinary nature of environmental issues, this paper analysis The International Environmental Law and regulations, EU Environmental Law and The Law on Environmental Protection in the Republic of Serbia.

Keywords: environmental protection law, climate change, natural resources, sustainable development.

INSTITUCIJE EVROPSKE UNIJE U SUZBIJANJU EKOLOŠKOG KRIMINALA: ZNAČAJ I IZAZOVI

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Ekološki kriminalitet je u dokumentima Evropske unije predstavljen kao specifična pretnja čije se posledice mogu ispoljiti na lokalnom, regionalnom pa čak i globalnom nivou. Uzimajući u obzir savremene oblike njegovog ispoljavanja, ekološki kriminlitet sve više predstavlja transnacionalnu pojavu pa otuda i potreba da mehanizmi njegovog suzbijanja budu na višem, nadnacionalnom nivou. Ovde pre svega treba imati u vidu da je dobit ostvarena ekološkim kriminalnim aktivnostima nesrazmerno velika u odnosu na rizik što predstavlja izazov za organizovane kriminalne grupe koje deluju na prostoru dve ili više država u okviru EU. Kao specifičan oblik integracije EU je u određenoj meri, izgradila pravni i instutucionalni okvir za suzbiljanje ove pojave uzimajući u obzir činjenicu da ekološke kriminalne aktivnosti prevazilaze granice nacionalnih država i da bilateralna saradnja nije dovoljna za sprovođenje zakona. Pitanje suzbijanja ekološkog kriminaliteta je stalno u centru pažnje svih relevantnih tela EU, koja svoju zakonodavnu aktivnost usmeravaju na prilagođavanje zakonodavnog okvira novim ali i postojećim oblicima ispoljavanja ekoloških kriminalnih aktivnosti. U radu se razmatra značaj i domašaj organa EU u suzbijanju ekološkog kriminala, uzimajući kao pravni osnov primarno i sekundarno zakonodavstvo Unije. Posebno će biti razmatrana pitanja nadležnosti Agencije EU za saradnju tela za sprovođenje zakona (EUROPOL), a takođe Agenciji EU za pravosudnu saradnju (EUROJUST) i projektu Evropskog javnog tužioca (EPPO) i drugih tela EU koja se delimično ili u celosti bave predmetnom materijom u skladu sa Direktivom EU o zaštiti životne sredine putem krivičnog zakonodavstva (2008) i dr. Cilj rada je da ukaže na značaj organa Evropske unije koji se bave suzbijanjem ekološkog kriminala, naročito onog sa elementom transnacionalnosti, i na permanentnu aktivnost EU kojom prilagođava svoj normativni i institucionalni okvir u ovoj oblasti čime se stvara mogućnost da, pored zakonodavstva u državama članicama, suzbijanje ove pojave bude efikasnije.

Ključne reči: ekološki kriminal, Evropska unija, zaštita životne sredine, Europol, Eurojust, EPPO.

EU INSTITUTIONS IN THE FIGHT AGAINST ENVIRONMENTAL CRIME: SIGNIFICANCE AND CHALLENGES

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Environmental criminality is presented in European Union documents as a specific threat whose consequences can be manifested at local, regional and even global level. Given the contemporary forms of its expression, environmental crime is increasingly a transnational phenomenon and hence the need for mechanisms to suppress it at a higher, supranational level. Here, first of all, it should be borne in mind that the profits generated by environmental criminal activity are disproportionately high in terms of risk, which poses a challenge for organized crime groups operating in the territory of two or more EU countries. As a specific form of integration, the EU has to some extent built a legal and institutional framework to counteract this phenomenon, taking into account the fact that environmental criminal activities transcend national borders and that bilateral cooperation is not sufficient for law enforcement. The issue of combating environmental crime is constantly the focus of attention of all relevant EU bodies, which focus their legislative activity on adapting the legislative framework to new and existing forms of environmental crime. The paper examines the importance and reach of EU bodies in combating environmental crime, taking primary and secondary Union legislation as the legal basis. Issues of competence of the EU Agency for the Cooperation of Law Enforcement Bodies (EUROPOL), the EU Judicial Cooperation Agency (EUROJUST), the project of the European Public Prosecutor (EPPO) and other EU bodies dealing partly or fully with the subject matter, the EU Directives will be discussed separately on the protection of the environment through criminal law (2008), et al. The aim of the paper is to highlight the importance of European Union bodies aiming at combating environmental crime, especially that with an element of transnationality, and to the permanent activity of the EU adapting its normative and institutional framework in this field, thus creating the possibility, in addition to legislation in the Member States, suppress this phenomenon more effectively.

Keywords: environmental crime, European Union, environmental protection, Europol, Eurojust, EPPO.

ЕКОТЕРОРИЗАМ И ЗАШТИТА ПРАВА ЖИВОТИЊА

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Рад обрађује однос законодавства Републике Србије према екотероризму и заштити права животиња и даје одређене предлоге. Екотероризам се појмовно одређује као саботажа намењена ометању активности перципиране као штетне за животну средину односно као скуп кривичних дела против компанија које спроводе активности штетне за животну средину. Рад разматра различите идеологије и активности из којих екотероризам потиче, као што су екофеминизам, дубинска екологија и екоанархизам. У раду се истиче став законодавца који још увек није препознао термин екотероризам. Упркос иницијативама парламентарних група које заступају високе стандарде у заштити животне средине Скупштина Србије није прихватила понуђене предлоге. Аутори разматрају начин на који су права животиња регулисана у националном правном оквиру, указујући на одређени несклад између Кривичног закона и Закона о сточарству који регулишу права животиња. Између осталог долази до одређених неусаглашености између два закона као и концепта права животиња и добробити животиња. Аутори закључују и износе предлоге за унапређење актуелног стања, те да је неопходно спровести темељнију едукацију становништва и законодавца, извршити усклађивање домаћих прописа са еуропским и на институционалном нивоу увести одређене органе и подстаћи међуресорну сарадњу како би се превенирале активности које утичу на појаву тенденција екотероризма.

Кључне речи: екотероризам, еколошки тероризам, екологија, тероризам, терор, права животиња, добробит животиња.

ECOTERRORISM AND PROTECTION OF ANIMAL RIGHTS

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The paper deals with the relation of the legislation of the Republic of Serbia to eco-terrorism and protection of animal rights and makes certain proposals. Eco-terrorism is conceptually defined as sabotage aimed at interfering with activities perceived as harmful to the environment, and a set of criminal offenses against companies that carry out activities harmful to the environment. The paper examines different activities as well as the ideologies from which eco-terrorism originates, such as eco-feminism, deep ecology and eco-anarchism. The paper emphasizes the position of a legislator who has not yet recognized the term eco-terrorism. Despite initiatives by parliamentary groups that advocate high environmental standards, the Serbian Parliament has not accepted the submitted proposals. The authors study the way in which animal rights are regulated in the national legal framework, pointing to a certain discrepancy between the Criminal Code and the Law on animal husbandry regulating animal rights. Among other things, there are inconsistencies between the two laws, as well as the concept of animal rights and animal welfare. The authors conclude and present proposals for improving the current state of affairs, by conducting more thorough education of the population and the legislator, harmonizing local regulation with the European Union, introducing certain institutional bodies and encouraging inter-ministerial cooperation in order to prevent activities that affect the emergence of ecotourism tendencies.

Keywords: eco-terrorism, environmental terrorism, ecology, terrorism, terror, animal rights, animal welfare.

STAVOVI STUDENATA BEOGRADSKE POSLOVNE I UMETNIČKE AKADEMIJE STRUKOVNIH STUDIJA O PRAVNOJ ZAŠTITI INOVACIJA U SRBIJI

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Globalizacija, liberalizacija, multikulturalizam i bespoštedna konkurencija predstavljaju eliksir za podsticanje i razvoj inovacija. Pravna zaštita inovacija i konsekvence za njeno kršenje su prisutne u svim efikasno i efektivno uređenim pravnim sistemima. Kršenje pravne regulative može doći usled nepoznavanja propisa ili namernog zanemarivanja pravne zaštite inovacija. Cilj rada jeste sagledavanje poznavanja, svesnosti posledica kršenja i namernog kršenja pravne zaštite inovacija studenata BPUASS. Empirijsko istraživanje sprovedeno je na 325 studenata treće godine, koji pohađaju predmet Menadžment inovacija. Rezultati su ukazali da su studenti upoznati sa posledicama kršenja pravne regulative, ali da su spremni da ih zanemare ukoliko neće trpeti posledice. Osnovni doprinos studije jeste da je prva koja analizira spremnost poznavalaca pravne zaštite inovacija prema njihovom svesnom kršenju.

Ključne reči: pravna zaštita inovacija, stavovi studenata, spremnost za kršenje propisa, BPUASS

ATTITUDES OF STUDENTS OF THE BELGRADE BUSINESS AND ART ACADEMY OF VOCATIONAL STUDIES ON THE LEGAL PROTECTION OF INNOVATION IN SERBIA

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Globalization, liberalization, multiculturalism and ruthless competition are the elixir for the promotion and development of innovation. Legal protection of innovation and consequences for its violation exist in a regulation of all efficiently and effectively legal systems. Legal regulations can be violated due to ignorance or intentional disregard regulations of legal protection of innovation. The aim of this paper is to review the knowledge, awareness of the consequences of violations and deliberate violations of the legal protection of innovations of BPUASS students. An empirical study was conducted on 325 third-year students, who attended the Innovation Management course. Results have been confirmed that students were aware of the consequences of violating legal regulations, but that they were prepared to ignore them if they did not suffer the consequences. The main contribution of this study is that it is the first which analyzes the willingness of the connoisseurs of the legal protection of innovations to knowingly violate them.

Keywords: legal protection of innovation, attitudes of students, willingness to violate regulations, BBAAVS.

ЧЕТВРТА ИНДУСТРИЈСКА РЕВОЛУЦИЈА У СВЕТЛУ ЕКОЛОШКОГ ПРАВА

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У оквиру рада који Вам пласирамо такозвани основни објект ка коме усмеравамо пажњу је четврта индустријска револуција у светлу зелене економије и заштите животне средине. Ми, полазећи од актуелне индустријске револуције, како смо је дефинисали унутар претходног текста „Четврта индустријска револуција, зелена економија и социјалне димензије одрживог развоја“, указујемо и на неке, а сматрамо
основне, елементе еколошког права од круцијалног значаја за њено остваривање. Али на начин и под условима који воде ка зеленој економији и стално одрживом развоју. Развоју који неће производити еколошки негативне ефекте већ оне позитивне и одрживе.
Сагледавање неопходних еколошко-правних елемената има два нивоа:

- међународно-правни, пре свега исказан на глобалном нивоу, и
- унутарње правни, то јест ниво законодавстава суверених држава, а који се по најпре очитује у оквиру еколошког законодавства, али не и само њега.

Јасно, пажња нам се усмерава на потребу, путеве и средства заштите:
1. еколошких медијума (воде, ваздуха, земљишта), али и
2. обновљивих ресурса,
3. необновљивих ресурса,
4. озонског слоја,
5. од негативних климатских промена,
6. шума,
7. путем правилног поступања са отпадом,
8. коришћењем секундарних сировина, али и
9. адекватног трошења енергије.

А све то захтева:

- на првом месту адекватан политички приступ реченом, отуда и
- формирање адекватних елемената законодавстава, по најпре у складу са већ формираним међународно-правним елементима, али и елементима националних законодавстава, а у складу са потреба на конкретном терену и под конкретним условима.

При том смо мишљења да управо еколошко-правна регулација, а у светлу зеленог економског развоја, може позитивно да утиче на четврту индустријску револуцију, о чему и говоримо нашим текстом, мада, обзиром на простор адекватан чланцима, на доста сажет начин.

Кључне речи: четрврта индустријска револуција, зелена економија, еколошки правни приступ, међународно правао, национална законодавства.

FOURTH INDUSTRIAL REVOLUTION IN THE LIGHT OF ENVIRONMENTAL LAW

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In the context of our work we observe, as so-called basic object, the fourth industrial revolution in the light of the green economy and environmental protection. We, starting from the current industrial revolution, as we define it within the previous text "Fourth industrial revolution, the green economy and social dimensions of sustainable development," points to some, we think basic elements of environmental law, as crucial elements for its implementation and realization. But at the manner and under conditions conducive to a green economy and continual sustainable development. Development which will not produce environmentally negative effects, but effects that are positive and sustainable. This leads us to the consideration of the necessary ecological and legal elements formed on two levels:

- International-law, especially that is expressed globally, hence the
- Legislatures of states, the level which is primarily manifested in the context of environmental legislation, but also through the other elements of positive legislatures.

Obviously, our attention is directed to the need, ways and means of protection of the:

1. Environmental media (water, air, soil), and
2. Renewable and non-renewable resources,
3. Non-renewable resources, and also
4. Ozone layer,
5. Negative climate changes,
6. Forests,
7. Proper treatment of waste,
8. Use of secondary raw materiala, and
9. Adequate power is consumed.

All this requires:

- in the first place adequate political approach to the aforesaid, hence the
- establishment of appropriate elements of the legislation, at first place in accordance with the already formed international legal elements, but, having this in mind, also elements of national legislations in harmony with needs manifested at specific fields and under specific conditions.

At the same time we think that environmental-law regulations in the light of green economic development, can have a positive impact on the fourth industrial revolution. This we explain laconically, having in mind the usual space of scientific articles.

Keywords: The fourth industrial revolution, green economy, environmental law approach, the international Right, the national legislation.

КОРПОРАТИВНА ДРУШТВЕНА ОДГОВОРНОСТ – УЛОГА И ЗНАЧАЈ У ЗАШТИТИ ЖИВОТНЕ СРЕДИНЕ У ИНДУСТРИЈИ 4.0

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Према Светском економском форуму, четврта индустријска револуција или популарно Индустрија 4.0 се развија од почетка 21. века. Сам концепт дефинисан је као револуционарна промена заснована на фузији дигиталног, виртуелног и реалног, односно спој различитих технологија (интернет ствари, вештачка интелигенција, машинско учење) а такође многих других технологија развијених у прошлом веку. Многе технологије из различитих области индустрије резултирају и променама у начину пословања, који између осталог укључују корпоративну друштвену одговорност. Закључци Париског самита 2015. године недвосмислено указују на алармантно стање у погледу проблема прекомерног загађења животне средине и неопходност инкорпорирања принципа одрживог развоја у све системе пословања.
У раду ће бити размотрен потенцијал корпоративне друштвене одговорности из визуре њене еколошке димензије, тј. могућности интегрисања бриге о животној средини у своје пословање и интеракцију са заинтересованим странама, не угрожавајући економски резултат. Другим речима у којој мери корпоративна друштвена одговорност може омогућити економски развој уз очување животне средине, односно испуњења услова одрживог развоја и успостављања зелене економије.

Кључне речи: корпоративна друшвена одговорност, еколошка корпоративна друштвена одговорност, индустрија 4.0, нове технологије, зелена економија.

CORPORATE SOCIAL RESPONSIBILITY – ROLE AND IMPORTANCE IN ENVIRONMENTAL PROTECTION IN INDUSTRY 4.0

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According to the World Economic Forum, The Fourth Industrial Revolution, or Industry 4.0, has developed since the beginning of the 21st century. The concept itself is defined as a revolutionary change based on the fusion of digital, virtual and real, that is, the fusion of different technologies (Internet of Things, Artificial Intelligence, machine learning, etc.) and a change in business, which includes corporate social responsibility, among other things. The conclusions of the 2015 Paris Summit unequivocally point to the alarming state of the issue of over-pollution and the need to incorporate sustainable development principles into the business system.
This paper will analyze the potential of corporate social responsibility from the perspective of its ecological dimension, i.e. opportunities to integrate environmental concerns into businesses and interact with stakeholders without compromising economic performance. In other words, the extent to which corporate social responsibility can facilitate economic development while preserving the environment, that is, meeting the conditions of sustainable development and establishing a green economy.

Keywords: Corporate Social Responsibility, Environmental Corporate Social Responsibility, Industry 4.0, new technologies, green economy.

PRAVNA REGULATIVA UPOTREBE DRONOVA U SRBIJI

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Dronovi i njihova civilna upotreba brzo su pronašli mesto u Republici Srbiji. S obzirom na značaj primene, a posebno na rizike koje ove bespilotne letilice sa sobom donose, domaći zakonodavac je pristupio temeljnom regulisanju prava na posedovanje i korišćenje dronova. Pravni okvir za njihovo bezbedno korišćenje predstavlja Zakon o vazdušnom saobraćaju. Nadležnost za njihovo evidentiranje, održavanje i kontrolu ispunjenosti uslova za korišćenje poverena je Direktoratu civilnog vazduhoplovstva. Na osnovu zakonskih odredbi je najpre donet 2015. godine Pravilnik o bespilotnim vazduhoplovima. Ipak, brzi razvoj tehnologija i novi izazovi uslovili su donošenje novog Pravilnika o bespilotnim vazduhoplovima početkom 2020. godine. Ovim propisom utvrđena su i brojna ograničenja. Cilj ovog članka je ukaže na mogućnosti koje zakonodavac treba da iskoristi u budućnosti, radi profitne i društveno odgovorne upotrebe bespilotnih letilica, posebno u oblasti poljoprivrede i zaštite životne sredine, ali i na neophodnost zaštite lica i imovine, kao i podataka o ličnosti.

Ključne reči: Srbija, zakonski propisi, dronovi, letilice, upotreba.

LEGAL REGULATION ON USE OF DRONES IN SERBIA

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Drones and their civil use quickly found a place in the Republic of Serbia. Bearing in mind the importance of their use and especially the risks that these unmanned aerial vehicles bring with them, the national legislator started with the basic regulation of the right to own and use drones. The legal framework for their safe use is the Law on Air Traffic. Competence for their registration, maintenance and control of fulfillment of conditions for use is entrusted to the Directorate of Civil Aviation. Based on the legal provisions, the Rulebook on Unmanned Aircraft was first adopted in 2015. However, the rapid development of technologies and new challenges have led to the adoption of a new Rulebook on Unmanned Aircraft in early 2020. This regulation also sets out a number of restrictions. The aim of this article is to point out the possibilities that the legislator should use in the future, for the profit and socially responsible use of drones, especially in the field of agriculture and environmental protection, but also the necessity of protection of persons and property, as well as personal data.

Keywords: Serbia, legal regulation, drones, airborne, use.

POSEBNOST PREVENTIVNE EKOLOŠKE PARNICE

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Cilj ovoga rada je da ukaže na značaj i specifičnost preventivne ekološke parnice, posebno u svetlu potrebnih zakonskih izmena u srpskom procesnom pravu. Pravo na zdravu životnu sredinu predstavlja centralni predmet regulisanja savremenog zakonodavstva. U pitanju je osnovno ljudsko pravo i zbog toga svako fizičko lice može da podnese ekološku tužbu, a postupak veštačenja u ovim parnicama je izuzetno kompleksan. Problem se dodatno usložava i visokim troškovima veštačenja. Zbog opšteg interesa za zaštitu zdravlja, zakonodavac mora da propiše hitnost u postupanju i da ukupne troškove, posebno troškove veštačenja, svede na minimalnu meru.

Prema našem mišljenju, de lege ferenda u okviru posebnih pravila o preventivnoj ekološkoj parnici treba voditi računa o ograničenom režimu dokaznih sredstava u postupku dokazivanja određenih činjenica. Ove vrste zabrana spadaju u relativne zabrane koje propisuju da se određene činjenice mogu dokazivati samo određenim dokaznim sredstvima. Zbog složenosti i značaja veštačenja u preventivnim ekološkim parnicama, naš predlog bi bio da se de lege ferenda uvede jasno propisano ograničenje koje ima značaj relativne zabrane. S tim u vezi, zakonska norma kojom bi se uredio režim relativne zabrane mogla bi da glasi: „U ekološkim sporovima sporne činjenice o zaštiti životne sredine ne mogu se utvrđivati drugim dokaznim sredstvima osim veštačenjem. Veštačenje se određuje putem veštaka upisanog u registar sudskih veštaka u oblasti zaštite životne sredine“.

Uz postojećeg tužioca i na njegovoj strani u preventivnoj ekološkoj parnici mogu se umešati kao jedinstveni suparničari i određena pravna lica i nadležni organi uz ispunjenje dva uslova: da su sami ovlašćeni za podnošenje tužbe i da mogu samostalno da podnesu takvu tužbu. Kao obični umešači mogu se pojaviti i druga fizička i pravna lica čiji se interesi štite podnetom tužbom za zaštitu kolektivnih interesa i prava. Osnovni smisao i pravozaštitni cilj preventivne ekološke tužbe jeste da se spreči nastupanje štete u slučaju da šteta preti neodređenom krugu lica. Preventivnopravna zaštita proteže se na veći broj štetom ugroženih lica zbog čega preventivna ekološka parnica ima i javnopravno obeležje. Ukoliko se zakonodavac odluči da uvede nov institut u našu parničnu proceduru, to bi zahtevalo i dodatno osposobljavanje ne samo sudija nego i drugih učesnika u postupku preventivne ekološke parnice, posebno veštaka. Zbog toga je nužno da uporedo nastanu promene i u drugim zakonskim propisima.

Parnica radi zaštite kolektivnih interesa i prava svoju delotvornost ostvaruje ukoliko pozitivnim posledicama utiče i na fizička i pravna lica čija se prava štite u takvoj parnici. Upravo zbog toga, de lege ferenda treba proširiti dejstvo subjektivne pravnosnažnosti presude i na fizička i pravna lica koja naknadno pokrenu parnicu za naknadu štete kako bi se oni mogli pozvati na utvrđenje iz presude kojom je usvojen zahtev iz tužbe za zaštitu kolektivnih interesa i prava. Posebno zakonsko uređenje

ekološke parnice bio bi pozitivan iskorak u pravcu zaštite životne sredine kao opšteg dobra. Time bi se zaštita opšteg interesa (zdrave životne sredine) učinila delotvornijom kroz nova zakonska pravila o posebnoj ekološkoj parnici. Na taj način bi se učinilo efikasnijim i načelo pristupa pravosuđu.
Posebnost preventivne ekološke parnice je višestruka. Pre svega, tiče se ovlašćenja za podnošenje tužbe, pravila o jedinstvenim i običnim umešačima, značaju veštačenja u dokaznom postupku, hitnosti postupka, proširenom dejstvu subjektivne pravnosnašnosti presude i, s tim u vezi, stvarne legitimacije za pokretanje postupka prinudnog izvršenja. Zbog svega ovoga, postoji više nego dovoljan broj razloga da se u srpskom parničnom postupku de lege ferenda uredi poseban postupak zaštite kolektivnih interesa i prava koji bi uključivao i posebna pravila u pogledu preventivne ekološke parnice.

Ključne reči: zdrava životna sredina, pravni značaj preventivne ekološke parnice

SPECIFICITY OF PREVENTIVE ENVIRONMENTAL LITIGATION

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The aim of this paper is to point out the importance and specificity of preventive environmental litigation, especially in light of the necessary legal changes in Serbian procedural law. The right to a healthy environment is a central subject of regulation of modern legislation. This is a basic human right, and because of that, any natural person can file an environmental lawsuit, and the expertise procedure in these lawsuits is extremely complex. The problem is further complicated by the high cost of expertise. Due to the general interest in health protection, the legislator must prescribe urgency in the procedure and keep the total costs, especially the costs of expertise, to a minimum.
In our opinion, de lege ferenda within the special rules on preventive environmental litigation should take into account the limited regime of evidence in the process of proving certain facts. These types of prohibitions belong to the relative prohibitions that prescribe that certain facts can be proved only by certain means of evidence. Due to the complexity and importance of expertise in preventive environmental litigation, our proposal would be to introduce de lege ferenda a clearly prescribed restriction that has the significance of a relative prohibition. In this regard, the legal norm that would regulate the regime of relative prohibition could read: "In environmental disputes, disputable facts about environmental protection cannot be established by other means of evidence than expertise. The expertise is determined by an expert entered in the register of court experts in the field of environmental protection".

Along with the existing prosecutor and on his side in the preventive environmental litigation, certain legal entities and competent bodies can intervene as sole rivals, provided that two conditions are met: that they are authorized to file a lawsuit and that they can file such a lawsuit independently. Other natural and legal persons whose interests are protected by a lawsuit for the protection of collective interests and rights may also appear as ordinary interveners. The basic meaning and legal protection goal of a preventive environmental lawsuit is to prevent the occurrence of damage in the event that the damage threatens an indefinite circle of persons. Preventive legal protection extends to a larger number of persons endangered by damage, and therefore preventive environmental litigation also has a public law feature. If the legislator decides to introduce a new institute in our litigation procedure, it would require additional training not only of judges but also of other participants in the procedure of preventive environmental litigation, especially experts. Therefore, it is necessary for changes in other legal regulations to occur at the same time.

A lawsuit for the protection of collective interests and rights achieves its effectiveness if it has positive consequences for both natural and legal persons whose rights are protected in such a lawsuit. Precisely because of that, de lege ferenda, the effect of the subjective finality of the verdict should be extended to natural and legal persons who subsequently initiate a lawsuit for damages so that they can refer to the determination from the verdict which adopted the request from the lawsuit for protection of collective interests and rights. A special legal regulation of environmental litigation would be a positive step towards the protection of the environment as a common good. This would make the protection of the general interest (healthy environment) more effective through new legal rules on special environmental litigation. In that way, the principle of access to justice would be made more efficient.

The specificity of preventive environmental litigation is multiple. First of all, it concerns the authority to file a lawsuit, the rules on unique and ordinary interveners, the importance of expertise in the evidentiary procedure, the urgency of the procedure, the extended effect of the subjective finality of the verdict and, in that connection, the actual legitimacy for initiating enforcement proceedings. Due to all this, there are more than enough reasons to regulate a special procedure for the protection of collective interests and rights in the Serbian litigation de lege ferenda, which would include special rules regarding preventive environmental litigation.

Keywords: healthy environment, legal significance of preventive environmental litigation.

VAŽNOST DRUŠTVENO ODGOVORNOG POSLOVANJA I IZVEŠTAVANJA O NEFINANSIJSKIM INFORMACIJAMA

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Predmet rada jeste koncept treće generacije korporativne društvene odgovornosti (CSR) i oblici izveštavanja o nefinansijskim pokazateljima uspešnosti organizacija. Cilj rada je da se ukaže na neophodnost implementacije CSR u strategijsko odlučivanje kompanija, gde se kao logična posledica javlja javno izveštavanje o nefinansijskim pokazateljima prouzrokovanim takvim odlukama. Metodologija korišćena u radu je deskriptivna, metod analize i sinteze, kao i istorijski pregled različitih teorijskih stavova o CSR. Rezultati ukazuju na neophodnost implementacije koncepta strategijske korporativne društvene odgovornosti i javno prezentiranje integrativnog izveštavanja, koje bi prikazao pored finansijskih i odgovarajuće nefinansijske pokazatelje performansi organizacija. Značaj rada jeste da prvi analizira strategijsku CSR i pruža smernice za nefinansijsko izveštavanje.

Ključne reči: strategijska društvena odgovornost, nefinansijsko izveštavanje, integrativno izveštavanje.

THE IMPORTANCE OF CSR AND REPORTING ABOUT NON-FINANCIAL INFORMATION

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The subject of the paper is the concept of the third generation of corporate social responsibility (CSR) and forms of reporting on non-financial performance indicators of organizations. The aim of this paper is to point out the necessity of implementing CSR in the strategic decision - making of companies, where is the logical consequence public reporting on non - financial indicators caused by such decisions. The methodology used in the paper is descriptive, the method of analysis and synthesis, as well as a historical overview of different theoretical views on CSR. The results indicate the need to implement the concept of strategic corporate social responsibility and public presentation of integrative reporting, which would show financial and appropriate non-financial performance results of organizations. The importance of the paper is to be the first which analyses strategic CSR and provide guidelines for public non-financial reporting.

Key words: strategic corporate social responsibility, non-financial reporting, integrative reporting.

ЕКОЛОШКА ЕТИКА И ЖИВОТНА СРЕДИНА

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На почетку двадесет првог века може се с правом рећи да се људска популација суочава са еколошким изазовима који су без преседана у историји ове планете. Чињеница је да данас на земљи има много људи, далеко више од еколошке равнотеже коју наша планета може да подржи, због чега смо суочени са бројним проблемима, губитком биодиверзитета, климатским проблемима. Из тог разлога људи троше необновљиве или веома споро обновљиве ресурсе великом брзином и то нам јасно указује на врло озбиљне проблеме са којима се суочавамо већ данас, и са којима ће се поготово суочавати људи у будућности. Управо такав, доминирајући однос човека према природи, због чега се данас цела планета налази у опасности од потпуне деградације, условио је да се данас налазимо у времену када је етика која се одражава на пољу животне средине запостављена. Без једног новог морала који се оријентише на заштиту природу, али и етике која се састоји у томе да се будуће генерације узму у обзир као предмети наших моралних одговорности, опстанак на планети биће све тежи.

Кључне речи: екологија, еколошка етика, животна средина, екоцентричност, људи.

ECOLOGICAL ETHICS AND ENVIRONMENT

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At the beginning of the twenty-first century, it can be rightly said that human populations face environmental challenges in the history of this planet. The fact is that there are many people on earth today, far more than the ecological balance our planet can support, which is why we face numerous problems, loss of biodiversity, climate problems. For this reason, people are consuming non-renewable or very slowly renewable resources at high speed, and this clearly indicates to us the very serious problems that we are facing today, and which people will especially face in the future. This dominant attitude of people towards nature, which is why today the entire planet is in danger of complete degradation, conditioned that we are today at a time when the ethics reflected in the field of environment are neglected. The survival on the planet will be increasingly difficult without new nature-oriented morale, but also an ethics that is to consider future generations as objects of our moral responsibilities.

Keywords: ecology, ecological ethics, environment, ecocentricity, people.

ULOGA SREDSTAVA JAVNOG INFORMISANJA U ŠIRENJU INFORMACIJA OD OPŠTEG ZNAČAJA

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Kada dođe do velikih svetskih ili lokalnih kriza, čiji uzroci mogu biti različiti, pandemije ili pak veliki finansijski potresi, ekonomisti i stručnjci iz izvršne vlasti jedne zemlje donose niz ekonomskih mera okrenutih ublažavnju posledica krize. Jedna od mera koja se u Republici Srbiji sprovela kao pomoć stanovništvu u cilju ublažavanja posledica krize izazvane pandemijom Covid 19 je sledeća: svim punoletnim građanima namenjeno je po 100 evra. Ovo istraživanje treba da otkrije koliko su, a posebno na koji način, građani Republike Srbije upoznati sa ovim vidom pomoći, da li su je prihvatili, da li su se prijavili za pomoć preko programske platforme koristeći internet ili su se prijavili putem telefona. Širi kontekst ovakvog istraživanja može da ukaže na opsege socijalne provezanosti pojedinaca, kao i na modalitete javnog informisanja stanovništva. Tokom istraživanja, prilikom prikupljanja podataka, upotrebljen je istraživački instrument anketa, kojom je obuhvaćeno 1000 ispitanika. Reprezentativni uzorak predstavljaju građani različitog pola, starosnog doba i školske spreme. Prilikom ispitivanja korišćen je upitnik koji sadrži trinaest pitanja, a koji je realizovan putem telefonskih poziva u 50 lokalnih samouprava u Republici Srbiji. Rezultati istraživanja ukazuju da je informisanost o ovako važnoj društvenoj temi na visokom nivou, ali da presudnu uogu ipak igraju internet platforme, dok je na drugom mestu televizija. Ono što valja istaći jeste jačina međuljuskih odnosa koja takođe doprinosi u značajnoj meri širenju informacija.

Ključne reči: javno informisanje, Covid-19, ekonomska kriza, finansijska pomoć.

THE ROLE OF THE MEDIA IN THE DISSEMINATION OF INFORMATION OF GENERAL IMPORTANCE

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When major global or local crises occur countries bring a series of economic measures aimed at mitigating the effects of the crisis. One of them was implemented in the Republic of Serbia to help the population in order to mitigate the consequences of the crisis caused by the Covid-19 virus – all adult citizens are earmarked 100 euros. This research should reveal how much, and especially in what way, the citizens of the Republic of Serbia are familiar with this type of help, whether they have accepted it, whether they have applied for help through a software platform using the Internet or have applied by phone. The broader context of such research may indicate the extent of social attachment of individuals, as well as the modalities of public information of the population. During the research and the data collection the authors have used survey, which included 1000 respondents. A representative sample is composed by citizens of different sex, age and education. During the survey, a questionnaire containing 13 questions was used, which was realized through telephone calls to 50 local governments in the Republic of Serbia. The results of the research indicate that information on such an important social topic is at a high level, but that internet platforms still play a crucial role, while television is in second place. What is worth emphasizing is the strength of interpersonal relations, which also contributes significantly to the dissemination of information.

Keywords: public information, Covid-19, economic crisis, financial assistance.

ZNAČAJ EDUKACIJE ZA ODRŽIVI EKOLOŠKI RAZVOJ U RURALNIM PODRUČJIMA SVETA I U SRBIJI

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Danas je na globalnom nivou razvijen sveobuhvatni pristup u okviru Milenijumskih ciljeva razvoja, nazvan Edukacija ruralnih krajeva (ERK), sa osnovnim ciljem da se umanji nedostatak osnovnih ljudskih potreba i stvore mogućnosti za dostizanje društvenog i životnog blagostanja, u odgovarajućem ekološkom okruženju. Cilj rada je da se ukaže na neophodnost preduzimanja aktivnosti kao što su: obrazovanje, poboljšanje uslova života u okruženju, razvoj zelene ekonomije, kao i razvoj infrastrukture. Predmet rada je analiza slabije razvijenih krajeva Srbije i dostignutog stepena održivog razvoja i pismenosti. Jedna od glavnih karakteristika Srbije jeste neujednačen razvoj njenih regiona, gde je severni deo zemlje najrazvijeniji, dok jug i istočni krajevi zemlje zaostaju u razvoju. Stoga, autori primenjuju deskriptivnu i komparativnu metodu u radu i daju uporedni prikaz razvijenih i nerazvijenih regiona i ekološki razvoj Srbije i bogatih zemalja u svetu. Doprinos autora se sastoji u preporukama sa ciljem da se na osnovu dobre prakse, preduzmu mere i aktivnosti u ruralnim krajevima u cilju edukacije stanovništva i dostigne viši nivo održivog razvoja. Na taj način bi se i u slabije razvijenim regionima zemlje podigao odgovarajući nivo kvaliteta života, odnosno povećala socijalna sigurnost uz poboljšane uslove u životnoj sredini. Samim tim, ljudi bi postali sigurniji u sebe i spremniji da se i dalje obrazuju kako bi njihove osnovne potrebe bile zadovoljene i kako ne bi morali da brinu o svojoj egzistenciji, ili o egzistenciji svoje porodice.

Ključne reči: ruralno obrazovanje, ekološki razvoj, Milenijumski ciljevi, Srbija, zelena ekonomija, održivi razvoj.

IMPORTANCE OF EDUCATION FOR ECOLOGICAL SUSTAINABLE DEVELOPMENT IN RURAL AREAS OF THE WORLD AND IN SERBIA

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Today, a comprehensive approach under the Millennium Development Goals, called Rural Education has been developed globally, with the primary objective of reducing the lack of basic human needs and creating opportunities for social and life well-being in an appropriate environmental environment. The aim of the paper is to point out the necessity to undertake activities such as: education, improvement of living conditions in the environment, green economy development, and development of infrastructure. The subject of this paper is the analysis of the less developed parts of Serbia and the achieved level of sustainable development and literacy. One of the main features of Serbia is the uneven development of its regions, and on the one hand, the northern part of the country is the most developed, while on the other, the south and eastern parts of the country are lagging. Therefore, the authors apply a descriptive and comparative method in their work and give a comparative overview of developed and underdeveloped regions and the ecological development of Serbia and rich regions of the world. The authors' contribution consists in recommendations with a purpose to take measures and activities in rural areas, based on good practice, to educate the population and achieve a higher level of sustainable development. In this way the level of quality of life would be raised in the less developed regions of the country, i.e. the social security would be increased, with improved environmental conditions. As a result, people would become more confident in themselves and more willing to continue their education so that their basic needs are met and that they do not have to worry about their existence or that of their family.

Keywords: rural education, ecological development, Millennium Goals, Serbia, green economy, sustainable development.

ANALIZA STAVOVA GRAĐANA O EKOLOŠKOJ BEZBEDNOSTI NA TERITORIJI LOKALNE SAMOUPRAVE BOLJEVAC

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Savremeni način obavljanja privrednih aktivnosti, primenjene tehnologije u industriji i uopšte životni stil ljudi doveli su do toga da se savremeno društvo poslednjih godina suočava sa brojnim izazovima i pretnjama. Promene koje nastaju delovanjem čoveka na prirodu kao što su degradacija životne sredine ili neadekvatno korišćenje prirodnih resursa, što rezultira njihovim deficitom na lokalnom i regionalnom nivou, mogu da izazovu ili doprinesu nepovoljnoj nacionalnoj bezbednosti. Promene koje se dešavaju u životnoj sredini mogu imati izuzetno veliko psihološko dejstvo na ljude. Republika Srbija spada u ketegoriju zemalja u razvoju pa je kao takva opterećena brojnim izazovima tranzicionog procesa među kojima značajno mesto zauzimaju i eko-bezbednosni uslovi. U radu su prikazani rezultati istraživanja koje se odnosi na bezbednost životne sredine u lokalnoj samoupravi Boljevac, u istočnoj Srbiji, i izvršena je analiza stavova građana o ekološkoj bezbednosti na ovoj teritoriji.

Ključne reči: Ekološka bezbednost, životna sredina, Istočna Srbija, lokalna samouprava Boljevac.

RESULTS OF AN ANALYSIS OF CITIZENS' ATTITUDES ABOUT ENVIRONMENTAL SECURITY IN THE LOCAL COMMUNITY BOLJEVAC, EAST SERBIA

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The modern way of performing economic activities, the applied technology in the industry and general the change from traditional lifestyle have caused the modern society to face numerous challenges and threats in recent years. Environmental degradation and inadequate use of natural resources, resulting in their scarcity at local and regional level, are important factors that can cause or contribute to adverse national security. Environmental changes can also have a profound psychological effect on humans. The Republic of Serbia belongs to the category of developing countries and as such is burdened with numerous challenges in the transition process, among which an important place is occupied by eco-security conditions. This paper presents the results of research related to environmental safety in local government in eastern Serbia - Boljevac, and analyzes citizens' views on environmental safety in this territory.

Keywords: environmental safety, environment, Eastern Serbia, Boljevac local government.

EKONOMSKI, EKOLOŠKI I DRUŠTVENI ASPEKTI ODRŽIVOG UPRAVLJANJA OBNOVLJIVOM ENERGIJOM

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Sve veći broj naučnih istraživanja ukazuje da izvori obnovljive energije, koji predstavljaju jednu od ključnih komponenti održivog razvoja, pružaju perspektivu smanjenja ekološke ugroženosti uz istovremeno podsticanje ekonomskog i društvenog razvoja. Na osnovu navedenih činjenica postavljen je osnovni cilj istraživanja, koji predstavlja analiziranje ekološke, ekonomske i društvene prednosti korišćenja energije iz obnovljivih izvora. Rezultati sprovedenog istraživanja nesumnjivo dokazuju da proizvodnja energije iz obnovljivih resursa, pored ekološkog ima naglašen ekonomski i društevni aspekt. Brojne studije navedene u radu dokazuju da se ekološki, ekonomski i društveni aspekti korišćenja obnovljivih izvora energije odnose prvenstveno na korišćenje lokalnih izvora, čime se povećava stepen zaposlenosti, standard života lokalnih zajednica i ravnomerni regionalni razvoj. Obnovljiva energija ima strateški značaj za ukupni društveni razvoj, posebno u onim oblastima u kojima je ekonomski atraktivna zbog svoje dostupnosti. Razvoj energetskog sektora zasnovanog na ekološki čistim obnovljivim izvorima energije, doprinosi poboljšanju kvaliteta života ruralnog stanovništva i modernizaciji poljoprivrede.

Ključne reči: Obnovljiva energija, održivost, održivi razvoj

ECONOMIC, ENVIRONMENTAL AND SOCIAL ASPECTS OF SUSTAINABLE RENEWABLE ENERGY MANAGEMENT

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An increasing number of scientific researches suggests that renewable energy sources, which are one of the key components of the sustainable development concept, provide the prospect of reducing environmental vulnerabilities while encouraging economic and social development. Based on these facts, the main goal of the research is set, which represents the analysis of the ecological, economic and social advantages of using energy from renewable sources. The results of the conducted research undoubtedly prove that the production of energy from renewable resources, in addition to ecological, has an emphasized economic and social aspect. Numerous studies have shown that environmental, economic and social aspects of the use of renewable energy sources relate primarily to the use of local sources, which increases the level of employment, the standard of living of local communities and balanced regional development. Renewable energy has a strategic importance for overall social development, especially in those areas where it is economically attractive due to its availability. The development of an energy sector based on environmentally clean renewable energy sources contributes to improving the quality of life of the rural population and modernizing agriculture.

Keywords: Renewable energy, sustainability, sustainable development.

ZELENI LIDERI I ČETVRTA INDUSTRIJSKA REVOLUCIJA

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Novo industrijsko doba odlikuje brz tehnološki razvoj koji transformiše celokupno društvo, stvara nove sisteme vrednosti, nove poslovne modele, načine komunikacija, razmišljanja i delovanja. Svojim dometom i složenošću, inovacione visoke tehnologije redizajniraju temelje društva i zahtevaju novu paradigmu liderstva. Cilj ovog rada jeste da ukažemo na značaj četvrte industrijske revolucije za razvoj zelene ekonomije sa posebnim osvrtom na zelene lidere. Savremena tehnologija zahteva nova znanja, veštine i sposobnosti lidera. Da bi išli u korak sa vremenom, lideri četvrte industrijske revolucije trebalo bi da se odgovorno ponašaju, da kreiraju klimu koja podstiče na inovativnost, stvaralaštvo, prihvatanje promena i rizika, eksperimentisanje, saradnju u oblasti zaštite životne sredine, da budu pravedni. Nova paradigma liderstva značila bi: usredsrediti se na nove sisteme, podsticati društvo na digitalnu pismenost i ovladavanje novom tehnologijom, promovisanje održivosti, povezivanja, transparentnosti i etičnosti u poslovanju.

Ključne reči: liderstvo, lideri, četvrta industrijska revolucija, zeleni lideri, zelena ekonomija.

GREEN LEADERS AND THE FOURTH INDUSTRIAL REVOLUTION

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The new industrial age is characterized by rapid technological development that is transforming the entire society, creating new value systems, new business models, ways of communication, thinking and acting. With their reach and complexity, high-tech innovations redesign the foundations of society and demand a new leadership paradigm. The aim of this paper is to highlight the importance of the fourth industrial revolution for the development of a green economy, with particular reference to green leaders. Modern technology requires new knowledge, skills and abilities of leaders. To keep up with the times, the leaders of the Fourth Industrial Revolution should behave responsibly, create a climate that fosters innovation, accepting change and risk, experimentation, collaboration, environmentalism, being fair. A new leadership paradigm would mean: focusing on new systems, fostering society for digital literacy and mastering new technology, promoting sustainability, connectivity, transparency and ethics in business.

Keywords: leadership, leaders, fourth industrial revolution, green leaders, green economy.

ЛИДЕРСТВО У ЗАШТИТИ ЖИВОТНЕ СРЕДИНЕ

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У свету је све присутнија свест да је очување животне средине цивилизацијска обавеза човечанства. Коначно се схватило да за опстанак будућих генерација треба имати другачији однос према животној средини. У том смислу, очување животне средине као медијума рађања, битисања и развоја људске популације, животиња и биљака, представља незаобилазан фактор унутрашње стабилности и безбедности једне земље. У прилог томе говоре и чињенице да су многи поборници хегемоније великих сила, још пре више од четрдесет година, увидели да управо преко животне средине могу да угрозе многе државе и народе и тако остваре жељене циљеве. Лидерство и интегрални систем заштите животне средине обезбеђују остваривање права човека на живот и развој у здравој животној и спортској средини. Систем заштите животне средине чине мере, услови и инструменти за одрживо управљање, очување природне равнотеже, целовитости, разноврсности и квалитета природних вредности и услова за опстанак свих живих бића, као и спречавање, контролу, смањивање и санацију свих облика загађивања животне средине. С тим у вези, лидерство или вођење, као још једна од активности спортског менаџмента, је у функцији одрживог управљања природним вредностима и заштите животне средине, која се остварује у складу са Законом о заштити животне средине. "Животна средина" је скуп природних и створених вредности чији комплексни међусобни односи чине окружење, односно простор и услове за живот. "Квалитет животне средине" који јесте стање животне средине које се исказује физичким, хемијским, биолошким, естетским и другим индикаторима. Иако је заштита животне средине превасходно унутрашњи проблем сваке државе и народа, загађивање животне средине данас постаје све више светски проблем зато што радијација, биолошка или хемијска контаминација, загађен ваздух, реке и мора, истрошен озонски омотач и др. не познају границе и постају глобални еколошки проблеми.

Кључне речи: лидерство, животна средина, квалитет животне средине, заштита животне средине, систем заштите животне средине.

LEADERSHIP IN ENVIRONMENTAL PROTECTION

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There is an omnipresent view in the world that the preservation of the environment is a civilization obligation of humankind. Finally, there is a perspective that for the future generations we should consider preservation of environment as a very important question. In that context we should deeply care about stability and regard toward nature in its full perspective. Even forty years ago many representatives of great hegemony have seen that the environmental care is a key in which they can put in danger other states and their wellbeing. System of environmental care is consisted by many regulations, conditions and quality of human and other beings on this planet that we share together. Regarding that fact, leadership or leading and management serves for a greater cause in nature resistance and quality of life in general, sanation and improvement of life in general and it should be defined by the law in general. Considering that all concept of environment in general is defined by the multiple factors such as complex of biochemical and environmental factors which are defined as a “quality of life environment” and are very significant for proper functioning of inner problems and constitution of every state and nation in general. Considering the fact that the global problem of life environment is crucial for defining problems of radiation, biological and chemical pollution, river and lakes pollution, question of ozone cover and other important environmental problems.

Key words: leadership, life environment, quality of lifestyle, life environment, system of environmental protection.

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