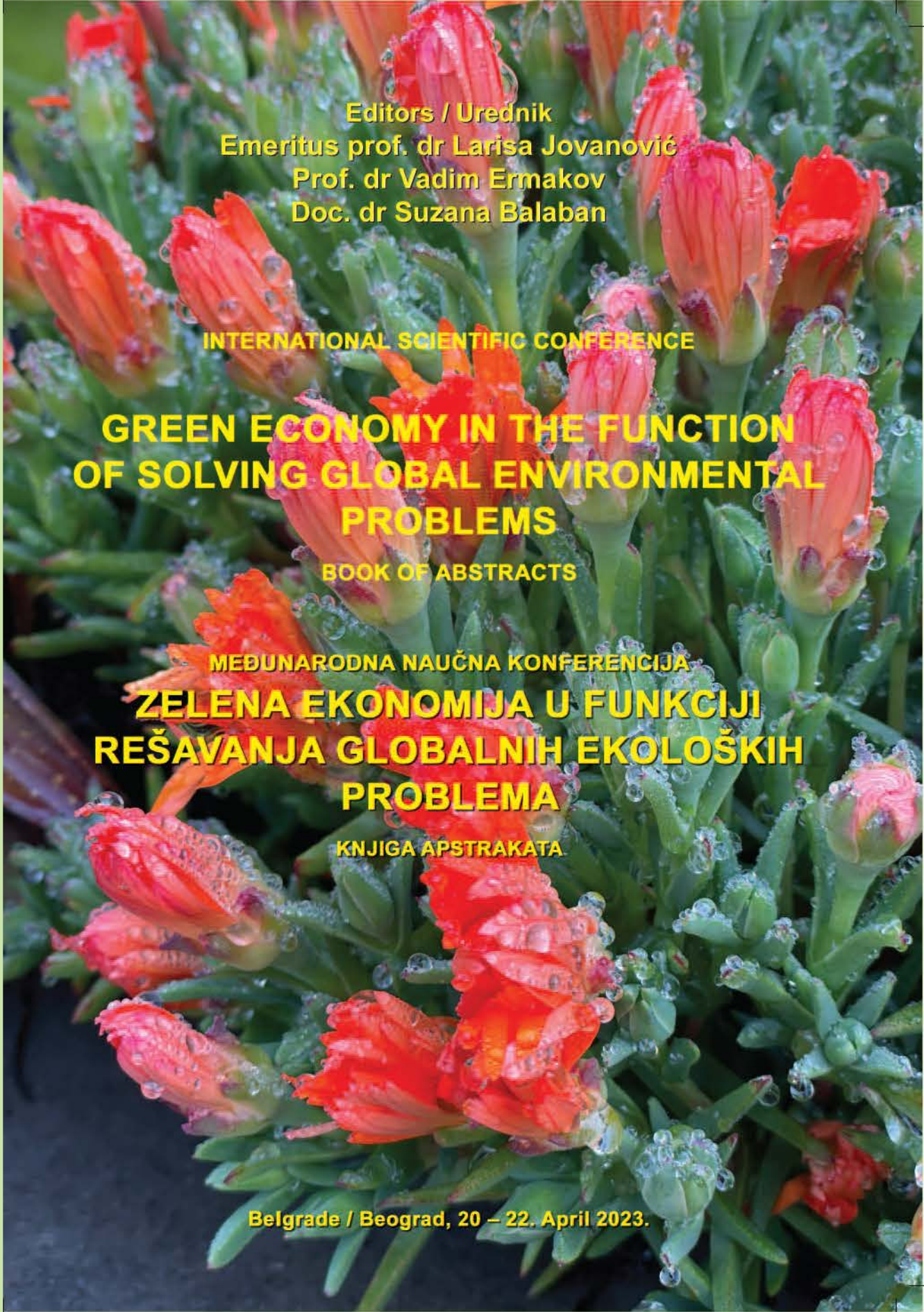

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Doc. dr Suzana Balaban

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GREEN ECONOMY IN THE FUNCTION OF SOLVING GLOBAL ENVIRONMENTAL PROBLEMS

BOOK OF ABSTRACTS

MEĐUNARODNA NAUČNA KONFERENCIJA

ZELENA EKONOMIJA U FUNKCIJI REŠAVANJA GLOBALNIH EKOLOŠKIH PROBLEMA

KNJIGA APSTRAKATA

Belgrade / Beograd, 20 – 22. April 2023.

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FOREWORD

This year, as in the previous 30, we are celebrating Earth Day as part of an international scientific meeting dedicated to the current topic of the day: Green economy in the function of solving global environmental problems. The conference is planned in a hybrid (off-line and on-line) mode using the Google meet platform.

In 2023, the International Scientific Conference will be held in cooperation with the Scientific and Professional Society "ECOLOGICA" with ALFA BK University, the Union of Engineers and Technicians under the auspices of the Ministry of Science, Technological Development and Innovation of the Republic of Serbia. This year's scientific conference Green Economy as a function of solving global environmental problems is focused on many topics related to the role of the Green Economy in environmental protection, which are distributed in the announcements of the Plenary Section and 4 other scientific sections:

- Green and circular economy as the basis of sustainable development,
- Renewable energy,
- Technogenesis and problems of environmental protection,
- The role of institutions in financing environmental protection.

The green economy includes many sectors of the economy, transport, primary production and application of renewable energy sources, organic agriculture, ecotourism, recycling of municipal waste, permanent disposal of toxic hazardous waste, purification of industrial and municipal water. For the development of the Green Economy, innovative multidisciplinary technologies, resource-saving technologies and the support of financial institutions are necessary in order to solve the problem of environmental protection.

The diversity and of environmental problems associated with numerous crises in the world require a multidisciplinary approach. Research into man-made changes in the environment is necessary, as well as monitoring and assessment of the impact of man-made pollutants on ecosystem health and human health.

About 90 scientific announcements by participants from the country and abroad from various scientific fields were prepared for presentation at the Conference: environmental monitoring and protection, economics, ecology, chemistry, biogeochemistry, physical chemistry, bio-technology, agronomy, environmental management, application of information technologies, financial management, sociology, law and political science.

Scientific announcements were prepared by teachers and doctoral students of ALFA BK University, as well as the Institute of Economic Sciences, the Belgrade Banking Academy, the Institute of Economics, the Academy of Economics in Novi Sad and other educational and research institutions, the Institute for Multidisciplinary Research, the Institute of Criminological and Sociological Research, the Vinča Institute, Mining Institute, NIVS, INEP, IHTM, Faculties of Geography, Forestry, Agriculture, Traffic and Economics from Belgrade, Kragujevac and Priština, as well as the Faculty of Occupational Safety of the University of Niš and many other faculties from state and private universities (Singidunum, Union, Megatrend, Union - Nikola Tesla, University of Defense).

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

Quality analyzes of the impact of the Green Economy on the state of the environment and on the sustainability of various spheres of industry, transport, ecotourism, which are based on valid data and information, as well as the application of systemic thinking and the formation of strategic decisions, are of great importance to decision makers in the field of environmental protection. Special attention should be paid to the planning of future international scientific research and the exchange of information from the field of environmental protection in order to develop scientific research work.

About 40 foreign scientists from 10 countries sent scientific papers. The participation of foreign scientists in the International Scientific Conference serves the exchange of information and the development of important directions in the field of environmental protection, and in this way can promote the improvement of successful cooperation between Russian, Belarusian, Moldovan, Chinese, Australian, Macedonian, Slovak, Slovenian, Turkish, Armenian, and Serbian scientists in new international projects.

Emeritus prof. dr Larisa Jovanović

PREDGOVOR

Ove godine, kao i prethodnih 30, slavimo Svetski Dan Planete Zemlje u okviru međunarodnog naučnog skupa posvećenog aktuelnoj temi sadašnice: *Zelena ekonomija u funkciji rešavanja globalnih ekoloških problema*. Konferencija je planirana u hibridnom (of-line i on-line) režimu uz korišćenje platforme Google meet.

Godine 2023 Međunarodna naučna Konferencija održava se u saradnji Naučno-stručnog društva „ECOLOGICA“ sa ALFA BK Univerzitetom, Savezom inženjera i tehničara pod pokroviteljstvom Ministarstva nauke, tehnološkog razvoja i inovacija Republike Srbije. Ovogodišnja naučna konferencija *Zelena ekonomija u funkciji rešavanja globalnih ekoloških problema* usredsređena je na mnoge teme povezane sa ulogom Zelene ekonomije u zaštiti životne sredine, koje su raspoređene u saopštenjima Plenarne sekcije i još 4 naučne sekcije:

- Zelena i cirkularna ekonomija kao osnove održivog razvoja,
- Obnovljivi izvori energije,
- Tehnogeneza i problemi zaštite životne sredine,
- Uloga institucija u finansiranju zaštite životne sredine.

Zelena ekonomija obuhvata mnoge sektore privrede, transporta, primarnu proizvodnju i primenu obnovljivih izvora energije, organsku poljoprivredu, ekoturizam, recikliranje komunalnog otpada, trajno zbrinjavanje toksičnog opasnog otpada, prečišćavanje industrijskih i komunalnih voda. Za razvoj Zelene ekonomije neophodne su inovativne multidisciplinarne tehnologije, resursoštedljive tehnologije i podrška finansijskih institucija u cilju rešavanja problema zaštite životne sredine.

Raznovrsnost i mnogostranost ekoloških problema povezanih sa mnogobrojnim krizama u svetu zahtevaju multidisciplinarni prilaz. Neophodna su istraživanja tehnogenih promena u životnoj sredini, a takođe monitoring i procena uticaja tehnogenih polutanata na zdravlje ekosistema i ljudsko zdravlje.

Za izlaganje na Konferenciji bilo je pripremljeno oko 90 naučnih saopštenja učesnika iz zemlje i inostranstva iz različitih naučnih oblasti: monitoringa i zaštite životne sredine, ekonomije, ekologije, hemije, biogeohemije, fizičke hemije, biotehnologije, agronomije, ekološkog menadžmenta, primene informacionih tehnologija, finansijskog menadžmenta, sociologije, prava i političkih nauka.

Naučna saopštenja pripremili su nastavnici i doktorandi ALFA BK Univerziteta, a takođe Instituta ekonomskih nauka, Beogradske bankarske akademije, Ekonomskog Instituta, Privredne Akademije u Novom Sadu i drugih obrazovnih i istraživačkih institucija, Instituta za muldisciplinarna istraživanja, Instituta kriminoloških i sociloških istraživanja, Instituta Vinča, Rudarskog instituta, NIVS, INEP, IHTM, Geografskog, Šumarskog, Poljoprivrednog, Saobraćajnog i Ekonomskog fakulteta iz Beograda, Kragujevca i Prištine, a takođe Fakulteta zaštite na radu Univerziteta u Nišu i mnogih drugih fakulteta sa državnih i privatnih Univerziteta (Singidunum, Union, Megatrend, Union – Nikola Tesla, Univerzitet odbrane).

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

Donosiocima odluka u oblasti zaštite životne sredine od velikog značaja su kvalitetne analize uticaja Zelene ekonomije na stanje životne sredine i na održivost različnih sfera industrije, transporta, ekoturizma koje se zasnivaju na validnim podacima i informacijama, a takođe primeni sistemskog mišljenja i formiranja strategijskih odluka. Posebnu pažnju treba posvetiti planiranju budućih međunarodnih naučnih istraživanja i razmeni informacija iz oblasti zaštite životne sredine u cilju razvoja naučno-istraživačkog rada.
Oko 40 stranih naučnika iz 10 zemalja, poslali su naučne radove. Učešće inostranih naučnika u Međunarodnoj naučnoj Konferenciji služi razmeni informacija i razvoju bitnih pravaca u oblasti zaštite životne sredine, i na taj način može pospešiti unapređenje uspešne saradnje ruskih, beloruskih, moldavskih, kineskih, australijskih, makedonskih, slovačkih, slovenačkih, turskih, jermenskih, i srpskih naučnika u novim međunarodnim projektima.

Emeritus prof. dr Larisa Jovanović

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Note: The authors bear full responsibility for the originality and content of their contributions.

Napomena: Autori radova snose punu odgovornost za originalnost i sadržaj svojih radova.

PLENARY LECTURES

PLENARNA PREDAVANJA

CONCENTRATION OF CHEMICAL ELEMENTS BY ORGANISMS AND THE USE OF THIS FUNCTION IN BIOTECHNOLOGY

Prof. Dr. Vadim Ermakov

Vernadsky Institure, Moscow, Russia

The concentration function of living matter is one of the central biosphere problems. It is associated with the synthetic and life-supporting activity of organisms. A striking example of such activity is photo- and chemosynthesis. The synthetic and concentration functions of organisms are controlled genetically and are specific to individual organisms. The concentration of macroelements is well known for organisms accumulating Ca, Mg, Sr, Si, Na, K, Fe, S, which is accompanied by the formation of biolites. The metabolic mechanisms of concentration of trace elements are associated with the physiological processes of regulation of their accumulation (absorption) – ion channels, competitive interactions and control by certain genes. This function of organisms (especially microorganisms) is the basis of modern biotechnologies. In particular, the specific accumulation of some rare elements by microorganisms, higher fungi and plants has been established, which can be the basis for the creation of new effective drugs for correcting the deficiency of trace elements and extracting rare elements from natural raw materials. Using the methods of genetics and geochemical ecology, biotechnologists have obtained effective preparations containing trace elements – iodine, selenium, cobalt, iron, molybdenum, used to correct microelementhoses of animals and humans. In addition, biotechnological methods of carbon dioxide utilization and hydrocarbon biodegradation are known. Hydrothermal organisms represent a special group of microelement concentrators. Thus, the development of the problem of concentration of trace elements by organisms gives not only new knowledge about the mechanisms of concentration of chemical elements, the peculiarities of their exchange and the impact on physiological processes, but also serves to create new technologies in ecology, microbiology, plant growing, medicine and veterinary medicine.

Keywords: biogeochemistry, biotechnology, concentration function, trace elements, organisms, photosynthesis, chemosynthesis, hydrotherms

The work was carried out according to the State assignment of GEOHI RAS

5G NETWORKS IN THE GREEN ECONOMY

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The green economy refers to an economic system that prioritizes sustainability, social equity, and environmental protection. It encompasses a wide range of sectors, including renewable energy, sustainable agriculture, green transportation, and waste management. The adoption of sustainable practices in these sectors is critical for achieving the goals of the United Nations Sustainable Development Goals (SDGs) and addressing the challenges of climate change.

The emergence of 5G networks offers an opportunity not only to improve communication technology, but also to reduce energy consumption and carbon emissions. 5G networks are fifth-generation cellular networks that deliver faster data rates, lower latency and greater capacity than their predecessors. However, they also require significant energy consumption, raising concerns about their environmental impact. Researchers are actively working to develop "green" 5G technologies that reduce power consumption while maintaining network performance.

One area is the use of renewable energy to power 5G networks. The deployment of 5G networks can facilitate the development and integration of renewable energy sources such as solar, wind, and geothermal energy. 5G networks can support monitoring and management of renewable energy systems, helping optimize energy production and reduce its losses. With the ability to transmit massive amounts of data in real-time, 5G networks can also enhance the efficiency of grid systems, enabling better integration of renewable energy sources. The integration of 5G networks and renewable energy systems can contribute to a sustainable, low-carbon future. Governments should work with telecommunications providers, energy companies, and other stakeholders to ensure that 5G networks are deployed in a way that maximizes their potential to support the development of renewable energy sources.

The carbon footprint of 5G networks is a complex issue that involves a range of factors, including the energy consumption of telecommunications equipment, data centers, and cloud computing services. While 5G networks are designed to be more energy-efficient than their 4G predecessors, the increased demand for faster data speeds and more connected devices is likely to drive up energy consumption. To mitigate the carbon footprint of 5G, telecom companies and governments must focus on energy-efficient infrastructure and renewable energy sources. This includes using more efficient hardware and software, implementing recycling programs for outdated equipment, and increasing incentives for renewable energy development. Additionally, end-users can also play a role in reducing the carbon footprint of 5G by adopting energy-saving practices, such as turning off devices when not in use and reducing unnecessary data consumption.

5G technologies are characterized by their energy-efficient hardware design. This is because 5G is designed to work with a variety of frequency spectrums, including high-frequency bands that consume more power than traditional cellular frequencies. To mitigate this issue, 5G base stations are designed with innovative cooling techniques and advanced power management systems to reduce energy consumption. Additionally, 5G devices incorporate advanced signal processing technologies that help minimize power consumption while maintaining high-speed connectivity. Using advanced algorithms to optimize the routing of network traffic can reduce the energy consumption of network components.

Furthermore, energy-efficient 5G technologies are crucial for next-generation applications like the Internet of Things, which requires billions of connected devices that can operate for years on a single battery charge.

Another area of research is energy harvesting for communication. This involves collecting and converting energy from the environment, such as light or vibration, into electrical energy that can power 5G devices. Energy harvesting can provide a sustainable power source for 5G devices, reducing the need to replace batteries and minimizing the environmental impact of electronic waste. Several research projects are currently exploring the potential of energy harvesting for 5G communications. For example, the Energy Harvesting for Autonomous Systems (EHAS) project, funded by the European Union, is developing energy harvesting devices that can power 5G sensors for smart cities and other applications. Another project, led by researchers at the University of Bristol, is studying the use of piezoelectric materials to harvest energy from environmental vibrations to power 5G devices.

In conclusion, green 5G technologies and energy harvesting for communications are promising research areas that could reduce the energy consumption and environmental impact of 5G networks. As the demand for faster and more reliable communication technologies continues to grow, it is important to consider the environmental impact of these technologies and work toward sustainable solutions. Future research should focus on developing and deploying these green technologies on a large scale to realize their full potential in the green economy.

Keywords: 5G technologies, 5G networks, green economy, renewable energy, energy harvesting, sustainability.

QUANTITATIVE PHYTOTOXIC EFFECTS OF MEMBRANOTROPIC CHEMICALS ON PLANT SPECIES

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In previous publications of S.A.Ostroumov and co-workers, it was shown that both synthetic surfactants and detergents, including laundry detergents (all are membranotropic chemicals), produce toxic effects on higher plants ([1-3] and others). The goal of this article is to present new data on bioassay of detergents which were not studied before in tests with higher plants. Here, some new results of the authors on quantitative phytoassay of toxicity of detergents are summarized briefly. Our new results discovered phytotoxicity of the synthetic detergents that were tested. The phytotest was conducted with two plant species, namely Vigna radiata and Lens culinaris. The quantitative data are presented for two characteristics that were studied, namely seed germination and root elongation. The results are useful to better assess environmental hazards from synthetic chemicals, to develop a scientific basis for environmental protection. The main results of our bioassay of some membranotropic chemicals with the two species of higher plants are as following.The study concluded that laundry powder, laundry liquid detergents (LLD) and hand sanitizer at different concentrations - 0.0% (control), 0.1%, 0.5% and 1.0% - showed the different deleterious effects on lentil (Lens culinaris) seeds and mung beans (Vigna radiata). The higher concentration of the test solution was assayed, the lower germination of the plant seeds was observed. At lethal concentration, no seeds could germinate in the Petri dish. As far as the different species of the higher plants, seed germination and root length of lentil (Lens culinaris) seeds were ever both more sensitive than that of mung beans (Vigna radiata). In terms of different detergents, laundry powders were more toxic than both laundry liquid and hand sanitizer in aqueous solution.

PROBLEMS OF SUSTAINABILITY MANAGEMENT OF THE OBJECTS OF THE DIGITAL ECONOMY

Academician William Saryan[1], Dr Roman Umansky[2]

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The unprecedented development of digital technology has led to a transformation in the structure of the traditional economy, modifying existing approaches to sustainability management of its objects. The platform economy has changed the business worldview in understanding new approaches to the development and implementation of a strategy to ensure the competitiveness and sustainability of economic objects. The most important project of the society today is the smart city project, which is designed to increase the competitiveness of cities and all business entities located on its territory through the formation of an effective urban management system, as well as the creation of safe and comfortable conditions for the life of citizens and the functioning of businesses. The smart city project involves the introduction of a set of digital solutions in a number of areas, such as smart city transport, public security systems, smart housing and communal services, communications, tourism, services, etc. However, the practical experience of project implementation shows the presence of a number of problems. First, the lack of a unified development system and a competent managerial approach to project implementation can be noted. The very concept of "smart city" in the regulatory documents is very vague and there is no clear idea of what should be implemented, the implementation algorithm and the set of services. As a result, different regions and cities understand the project their own way, which leads to ambiguity in the final results and assessment of the quality of its implementation, and also differently perceive the requirements for the development of digital infrastructure. To solve this problem, it is necessary to develop a unified methodology for the construction and development of the smart city project, as well as standardize the requirements for digital infrastructure. Secondly, it is important to build all the control loops of the smart city project. A clear system of state management of the project should be built, including the federal, regional and municipal levels of government.

It is also important to note that the inclusion of such important constituent elements as the development of a green economy, prevention of emergency situations, and taking into account the development of the geopolitical situation in the world, the inclusion of digital solutions in the field of cybersecurity, anti-terrorist protection, crime prevention, etc., has not been worked out.

In the opinion of the authors, the foundation for the digitalization of the smart city project should be the introduction and use of a single platform solution that reflects the information model of a modern city, taking into account all the control loops and services, which will allow the most efficient management system for a comfortable and safe urban environment.

Keywords: smart city, platform, digital infrastructure, sustainability management, sustainability.

MERCURY IN THE FOOD CHAINS OF THE CASPIAN SEA

Vyacheslav F. Zaitsev, Vladimir A. Chaplygin, Tatyana S. Ershova

Astrakhan State Technical University

Pollution of the marine environment with heavy metals is one of the reasons that threaten the conservation of biological diversity in the Caspian basin. Among those found, metal mercury refers to an element with high toxicity, which is able to accumulate in the human body, at this level of accumulation of the element being consumed along the carbohydrate chain. In the aquatic environment, microorganisms convert inorganic mercury into highly toxic methylmercury. The mercury contained in bacterial biomass is absorbed by zooplankton, which, in turn, serves as food for juvenile fish or (after death) benthic organs. The muscle tissue of aquatic organisms absorbs a rather high content of mercury (Komov et al., 2004). Accumulating in the tissues and organs of fish in amounts exceeding the maximum established norms, mercury poses a danger to human health.

In connection with this purpose, the study was to determine the levels of mercury in the muscles of the hydrobionts of the Caspian Sea, associated with the need for ecological groups: zooplanktophages - sprat (Clupeonellaculriventris caspia Svetovidov), benthophages - roach (Rutilus rutilus caspicus Jakowlew), Russian sturgeon (Acipenser gueldenstaedtii Brandt), Persian sturgeon (Acipenser persicus Borodin), predators - herring (Alosa kessleri kessleri Grimm), Caspian seal (Phoca caspica Gmelin).

The bioaccumulation factor of mercury in the body's muscle tissue increases with higher trophic glucose levels. Among the studied species of aquatic organisms, sprat accounts for a smaller proportion of mercury in muscles. Among benthophagous fish, the accumulation of mercury in the muscles of the vobla was lower than in the muscles of the Russian and Persian sturgeon by 1.4 and 1.9 times, respectively. Perhaps this is due to the fact that sturgeons, in addition to benthos (their own and fine food), also consume small fish (gobies and sprats) (Ivanov and Komarova, 2008). Thus, sturgeons, being benthivorous, are partially engaged in the trophic level of predators. At the same time, the Persian sturgeon, which has a higher rate of linear and weight growth, accumulates higher concentrations of mercury in the muscles. The maximum level of accumulation of mercury was noted in the muscles of agriculture, compared with fish feeding on plankton or benthos. In the muscles of herring, the content of mercury is higher than in benthophages (2.7; 1.88 and 1.39 times higher in voble, in Russian and Persian sturgeon, respectively). And in the case of sprat, which is one of the main food objects, the level of mercury accumulation was almost 7 times higher than the blackback muscles. The maximum level of mercury content in muscle tissue compared to other aquatic organisms was recorded in the Caspian seal.

According to the content of mercury in the muscles, the studied hydrobionts can penetrate in the following descending order: Caspian seal > herring > Persian sturgeon > Russian sturgeon > roach > sprat.

When studying the types of aquatic organisms by trophological characteristics, a clear dependence of mercury consumption in muscles on the type of nutrition was demonstrated. With an increase in the occupied position in the trophic pyramid in people with a high level of metal content (r = 0.96) (Ershova, Zaitsev, 2004). This is probably due to the fact that mercury forms very stable mercury-organic complexes arising from biological molecules of almost all other metals. This property of mercury causes an irreversible increase in its concentration during the transition along the trophic chain from lower to higher organs.

Keywords: sprat, roach, Russian sturgeon, Persian sturgeon, Caspian seal, zooplankt feeders, benthophages, predator, mercury, bioaccumulation

The research was carried out with the financial support of the Russian Science Foundation within the framework of scientific project No. 23-24-10043.

THE IMPACT OF CRYPTOCURRENCIES ON THE ENVIRONMENT AND THE INCREASED RISK OF MONEY LAUNDERING AND THE FINANCING OF TERRORISM AT THE MICRO AND MACRO LEVEL

Marijana Joksimović, full professor[1], Nikola Vukčević, associate professor[2], Larisa Jovanović, professor emeritus[1]

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[2]University Adriatic Bar, Faculty for mediterranean business studies Tivat, Montenegro

Authors in the paper are investigating the influence of cryptocurrency on the environment, as well as the increased risk from money laundering and terrorism financing. The impact of cryptocurrency on environment, depends on which energy sources they use for mining.
Experts estimates that mining cryptocurrency produces more CO2 than some multinational companies like: Coca-Cola and Nike together, producing even more than 20 million cars or one average European country.
By inspecting the register of service providers associated with virtual currencies, in the Republic of Serbia, it can be traded with next cryptocurrencies: Bitcoin, Ethereum, Litecoin Tether, USD Coin, and DaiDai. Currently, only two official service providers associated with virtual currencies exists for the reception, transfer, and execution of orders who are related to the buying and selling of virtual currencies for third person's accounts, who have got work permission from National bank of Serbia for all kinds of services associated with virtual currencies. Services of buying and selling virtual currencies for paper money and/funds on the account and/or electronic money. Services for changing virtual currencies for virtual currencies, or another digital property if economic society owns permission from the Commission for value papers for providing a service related to another by type digital property. Storage and administration of virtual currencies for users of virtual currencies and connected services.
On the other side, at the global level exists three digits number of cryptocurrencies with which are traded. In addition to the authorized service providers associated with virtual currencies on the Internet, appeared about the gearbox without permission for work. Is it about laundering money or try other kinds of abuse, authors in work epmhasize the protection of financial users a favor on the micro and macro level
Time series were used in this paper wich include data that are related to the period from 2014 to 2023. All used data from 2014 to 2022 in the work, were processed on the annual level, while first quarter data from 2023 were included.

The Keywords: Cryptocurrencies, Environments protection, Money laundering and Risks.

This paper is part of the research results on project U 01/2023 Green economy in the era of digitization, Faculty of Finance, Banking, and Auditing, Alpha BK University.

THE RISK-ORIENTED APROACH IN THE SOLUTION OF PROBLEMS OF ECOLOGICAL SAFETY OF FOOD MONITORING IN RUSSIA

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At the present stage of development of the concept of assessment and risk management special relevance is acquired by its use for optimization of the monitoring works including which are carried out by Rosselkhoznadzor. The main priorities of any state monitoring system of quality of foodstuff are: providing the population with ecologically safe agricultural products, and also creation for domestic and foreign suppliers of conditions of transparency and availability of domestic market. In this aspect activity of Russian Rosselkhoznadzor differs in nothing from work of similar departments in other countries.

The present stage of development of agro-industrial complex and market of its products in the Russian Federation is characterized by existence of the interconnected problems of ecological and economic character. A few years ago in Federal State Budgetary Institution All-Russian State Scientific Control Institute lot of work on creation of evidence-based domestic system management quality control of the food and forages, similar to those foreign analogs which accepted to call HASSP (European Union), KOSHRUT (Israel) and HALYAL' (Arab world) is finished. Its working name - "the risk-oriented approach at food monitoring". Are declared by the purposes: safety of foodstuff; minimization of risks; increase of level of detectability of violations of the quality standards at food monitoring.

For their achievement it is supposed to solve the following problems: development of models risk-oriented state monitorings; monitoring of efficiency of control and supervising actions; development of profiles of risks by types of products; assessment of risk of import; assessment of laboratory activity; assessment of activity of Territorial Administrations. Let's consider some debatable moments of the offered approach.

So, in respect of carrying out the monitoring directed to detection of intestinal infections reduction of number of samples of meat, fish and milk during the whole year is provided. It is not quite reasonable. During the warm period of year in the large cities of our country and in rural areas periodically there are outbreaks of intestinal infections. In our opinion, it is more reasonable to hold during the summer period control and supervising events with former intensity. During cold seasons of year the economy on the number of the conducted researches is possible.

Proceeding from the found faults, we propose the following measures for optimization of the considered approach: 1) Gradation from MTL of pollutants in foodstuff and sterns to integral assessment of their danger on set of indicators. It is necessary to consider synergy and antagonistic bonds of separate chemical elements and substances on organism of animals and the person, and also ecologo-biogeochemical situation in that region where the assessment of danger is carried out. 2) For some dangerous pesticides (DDT, lindane and heptachlor, for example) the patented techniques of prelethal intra organismal detoxication exist. They are rather cheap and rather effective. Decrease in costs of monitoring on these indicators when checking products of the enterprises applying similar techniques is reasonable. 3) With agroecological, veterinary (so, and medical) the points of view, shortage of vital microelement in the soil, sterns for farm animals and food stuffs of the person is not better than presence of heavy metal at all. It is absolutely necessary to carry out assessment of safety subsupervising to Rosselkhoznadzor of products on levels of the vital microelements.

Keywords: risk-oriented approach, ecological safety, food monitoring, most tolerance levels, heavy metals, vital microelements

EXISTING LIMITATIONS TO REACHING THE NOOSPHERE

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Currently, the concept of the role of the rapid development of a unified information and communication environment (ICS) is being formulated. Its content includes the technological foundations of the information society - as the only system that is able to provide a real opportunity for the evolution of mankind into the noosphere. The main task of the ICS is the transformation of the technosphere, bringing it into line with the condition to preserve the stability of the biosphere and the life support of the population, and not only physiological, but also higher spiritual needs associated with work and creativity. Such new information technologies as IoT, broadband, DB, AI, MO, virtual reality, predictive analytics, robots, information management networks, monitoring systems and many others are aimed at solving these global tasks. A single ICS allows you to get an accessible and trusted environment for the interaction of emergency measures and control systems. In it, humanity can unite efforts in solving common social tasks – combating natural phenomena, raising living standards, terrorism, in joint space, cultural and educational programs, in creating planetary movements and political organizations, in ensuring harmonious interaction between society and nature. The achievements of the ICS make it possible to implement three possible scenarios of the path to the formation of the noosphere:
noosphere (the main thing is the tasks of sustainable development, UN, UNESCO, ITU, etc., globalization);
degradation, when profit and the policy of domination prevail at the head of society - the concept of the "golden billion"; localization; senseless consumption of resources; impotence of international organizations – their sharp politicization; loss of the root cause and meaning of age-old traditions, national idea, family values, ancestral and genetic identity;
humanoid society (FM and M systems, AI and MO, robots, humanoid robots, deserted production and smart cities, etc. - humanoid society – the concept of the noosphere for a humanoid society).
Humanity is at a crossroads again. The choice is ours.

Keywords: noosphere, society, information technologies

COMPARATIVE ANALYSIS OF GREEN GROWTH INDICATORS AT THE INTERNATIONAL LEVEL

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Green growth may be defined as an environmentally sustainable economic growth. Some authors believe that limiting the use of resources, and therefore economic activity, is the only solution to reducing pollution. However, it is unlikely that this will be achieved. Therefore, the green growth is presented as an imperative of the modern economies transformation around the world.
That transformation takes time and the series of structural adjustments. In order to compare the green growth indicators at the international level, the authors use data from OECD statistics on an annual basis. The sample consists of 14 countries and covers the time period from 1990 to 2021. According to obtained results, the authors conclude that there are the significant differences between the green growth indicators of developed and developing countries.
The results are significant as support for green reforms implemented by policy makers in developing countries in order to reduce the environmentally pollution and maintain an optimal economic growth.

Keywords: Green growth indicators, Green economy, Sustainable development and Comparative analysis.

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GREEN AND CIRCULAR ECONOMY AS SYMBOLS OF ENVIRONMENTAL PROTECTION

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Life in the 21st century is characterized by the development of technological innovations which apace with the process of globalization, lead to the digitization of the world economy and represent a trend that is increasingly attracting the attention of researchers and scientists from different fields. However, the ecological crisis, which appeared partly as a result of the technological revolution, causes climate change, unsustainable use of natural resources, soil erosion, increased generation of waste, endangers the survival of plant and animal species, but also the entire humanity, and it has become the subject of attention and interest only in recent years. In this respect, we can ask a question whether in the "sea" of advantages offered by Industry 4.0, we have neglected the security threats of the dark cloud that has loomed over nature. The concept of a green economy has been developed by integrating the mentioned trends, and in order to eliminate or at least reduce environmental problems, by implementing green technological solutions which results in reducing the risk of pollution and environmental degradation, while improving human welfare and social equality. The green economy, especially through the circular economy, with its operating principles and implementation strategies, seeks to replace the model of industrial production, which is characterized as a "linear economy" and which becomes one of the main polluters of the environment. On this matter, the subject of research in this paper is the green and circular economy as two sides of the same coin, which represent a signpost towards the realization of the goals of sustainable development, i.e. economic growth and development while taking care of environmental protection and the survival of current and future generations. The aim of the work is to point out the advantages of applying the mentioned concepts, with special reference to the indicators that show the degree of implementation of the green and circular economy (GGEI - Global Green Economy Index, and Rate of circular use of materials) in the Republic of Serbia and the European Union. The basic hypothesis in this research is that the green economy is not only an available opportunity, but a condition for the survival of the living world and the preservation of natural resources.

Keywords: green economy, circular economy, sustainable development, the Republic of Serbia, European Union, GGEI, Rate of circular use of materials

BIOGEOCHEMICAL CYCLES OF TRACE ELEMENTS IN AGROECOSYSTEMS OF WESTERN SIBERIA

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The study concerns the biogeochemical differentiation of agricultural systems as a result of long-term experimental studies related to the assessment of local cycles of trace elements. Specific data on the content of Pb, Cu, Zn, Ni, Cd, Cr, Se in trophic chains under certain agroecological conditions are given. Geochemical and environmental factors affecting the accumulation of trace elements in various types of soils and plants cultivated on them have been identified. The obtained data are correlated with the normative quantitative characteristics of the need of plants for trace elements. The intensity of the action of trace elements on the chemical composition of soils and plants (cereals, fodder and vegetable crops), their productivity and quality has been established. Of particular interest are the data on the relationship of trace elements, their competitive and synergistic relationships. The physiological need of plants for the necessary trace elements at various stages of ontogenesis has been clarified. Ecological assessment of the obtained plant products was carried out on experimental animals. At the same time, the concentrations of chemical elements in organs and tissues were determined, and their morphological changes were analyzed. The parameters of the intake of trace elements into the body of animals with plant food under the conditions of model experiments have been established. Structural and functional changes in animal organs during feeding with crop products grown with different content of trace elements are analyzed.

Keywords: biogeochemistry, meadow-chernozem soil, plants, animals, cadmium, nickel, zinc, chromium, selenium, lead

The study was carried out according to the State task within the framework of the topic (AAAAAA-A17-117032210022-7) "Ecological assessment of the action of trace elements and ecotoxicants in the soil-plant-animal system in Western Siberia"

MANAGEMENT FEATURES OF KNOWLEDGE-INTENSIVE ENTERPRISES IN THE STATE IN MODERN ECONOMIC, POLITICAL AND ENVIRONMENTAL CONDITIONS

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The role of knowledge-intensive production in European countries is great. Improving safety at knowledge-intensive enterprises by creating, implementing and maintaining an emergency situation warning system using the IoT and sensitive sensors with signals from natural objects. Thus, damage to life, health of personnel, property of knowledge-intensive enterprises and the environment can be significantly prevented. Therefore, the implementation of an emergency situation prevention system in knowledge-intensive industries as part of the organizational and managerial mechanism at enterprises is of great importance. A knowledge-intensive enterprise with an emergency situation warning system is an integral part of the smart city. The statistics of emergency situations in the world is steadily growing due to the increased pressure of man-made and natural nature. Analyzing the risks of emergency situations, one can, of course, assume that some emergency situations are unacceptable under certain conditions, including natural and industrial ones. However, “The non-zero concept of risk reflects the fact that it is impossible to completely prevent and exclude the occurrence of man-made accidents, natural disasters and other emergency situations. It is only possible to reduce their number, reduce the damage from their consequences by monitoring, analyzing and reducing development risks. For any state, one of the strategically important tasks is to preserve the population in emergency situations, ensure its safety, and preserve the environment, infrastructure and industry. The study of knowledge-intensive and high-tech enterprises, the dynamics of foreign trade in highly processed goods is one of the tasks of a comprehensive economic analysis of the state and prospects for the development of the economy, as well as an indicator of the country's competitiveness Knowledge-intensive enterprises may include: radio-electronic and electronic enterprises; aircraft construction; shipbuilding; the creation of rocket and space systems, etc. The development of knowledge-intensive industries is a significant factor in economic growth, since countries in which a special place is given to the development of knowledge-intensive industries become intellectual leaders and are included in the group of highly developed countries.

Principles of management of knowledge-intensive enterprises

Principle 1:

Focus on employees and property of knowledge-intensive enterprises during emergency situations.

• The impact of the emergency situation warning system on the enterprise

• The focus of the implemented digital technologies on solving the problems of enterprises

• Priority problems of enterprises: safety of employees, property of knowledge-intensive enterprises

Principle 2: Formation of a stable and safe environment for employees and the safety of property of knowledge-intensive enterprises during emergency situations.
• Strengthening the capacity of enterprises
• Key factors in decision making during emergency situations
• Protection of personal data, resistance to loads
Principle 3: Maintaining a balance of interests, principles of development and opportunities.
• Coordinated work of the head of the enterprise with the participants of the structural divisions of the enterprise
• Decisions should reflect the interests of all structural divisions of the enterprise in a relevant way
Principle 4: Availability and convenience of an emergency warning system in a knowledge-intensive enterprise.
• Accessibility for each employee of the visual and functional properties of the system (design)
• The emergency warning system should be comfortable and understandable in use
Principle 5: Integrated, Interoperable and Open.
• Digital service integration
• Stay in a single information field
• Cost effectiveness analysis (openness)
• Availability of archival and actual data for their secondary analysis
Principle 6: Continuous improvement of management quality.
• The need to improve the organizational and managerial mechanism
• It is necessary to use the data of the digital system to analyze the weaknesses of the enterprise
Principle 7: Emphasis on economic efficiency.
• Using the service model
• Direct or indirect economic effect is facilitated by:
✓ Optimization of service delivery processes
✓ Transfer of municipal services to the digital series, the availability of statistics on the behavior of city residents
✓ Introduction of energy efficient technologies
✓ Analysis and forecasting of economic effects of urban planning activities
Principle 8: Priority of long-term solutions over short-term benefits.
Principle 9: Use of the best available technologies.
• It is necessary to estimate in advance the cost of technology and the complexity of its implementation
• Use of special digital sandboxes
I express my special gratitude to Sarian V.K., Doctor of Technical Sciences, Honored Worker of Communications of Russia, Science Consultant in FSBI NIIR (Federal State Budgetary Institution Order of the Red Banner of Labor Radio Research and Development Institute named after M.I. Krivosheev) for his assistance in my work.

Keywords: emergency situation, emergency situation warning system, management of knowledge-intensive enterprise, high-tech enterprise, smart city

NEW CONCEPTS AND TERMINOLOGY: APPLICATION TO SCIENTIFIC FOUNDATION FOR ENERGY –SAVING, CARBON-EMISSION MINIMIZING ECOLOGICAL BIOTECHNOLOGY

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In a series of our publications on ecological issues, we formulated several innovative ecological concepts and coined relevant concept-connected terminology. Both concepts and terminology are instrumental to analyzing details of natural ecosystem function. The functioning of healthy ecosystems including aquatic ecosystems is the driving force for many ecosystem services. When creating new ecological biotechnologies we try to create technological opportunities which carry the same functions that are fulfilled by natural ecosystems, e.g., to treat polluted waters. Therefore it is important to analyze the functioning of natural ecosystems in adequate terms. As a result, new terminology might be helpful in analysis of natural ecosystems and in creating artificial ecosystems which are being created to imitate/fulfill some of useful functions of natural ecosystems. Here we list some of the new ecological concepts that we formulated in a series of our publications, and while doing so, we coined several new terms, namely: (1) biomachinery, (2) ecological chemomediators, (3) ecological chemoregulators, (4) synecological summation of man-made effects, (5) exometabolism, (6) integral metabolism, (7) ex-living matter, and some others. These concepts and terms are applicable to better describing functions of natural ecosystems including their function in water self-purification in aquatic ecosystems. This function might be imitated or fulfilled by artificial ecosystems, in other words, by an innovative ecological biotechnology. Among the prospective advantages of this biotechnology are: (1) energy saving; (2) decreasing carbon emission to the atmosphere as a result of using photosythesizing organisms which uptake carbon dioxide. The innovative concepts and terminology mentioned above are described and explained in a series of our publications including [1-3] and others.

GASTRONOMY BASED ON TRADITIONAL AND ORGANIC FOODS IN PODRAVJE REGION (SLOVENIA)

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Healthy environment and organic food are preferences of some groups of tourists during their holidays. The aim of this contribution is to describe situation of traditional use of foods in gastronomy in Podravje region (Slovenia), (projects EKO-GASTRO, CRP V4-1514 and VINGATUR, V5-2030). Hypothesis that 'organic foods' with certified local organic production based on underutilized crops was not confirmed. Practically was difficult to find products from underutilized field crops from own local and traditional use. The question about local = traditional = organic products was redundant. Some of farmers agreed that it was a good idea.
On this base new findings will be part of presentation. Also, findings of historical used foods in Slovenian heritage, like a project Iron-Age-Danube, except promotional materials, did not find long term implementation of historical used foods (except in one organic farm without certified organic menu) in Slovenian gastronomy. As we can conclude that without governmental support, the structure of organic foods, such as traditional and historical valued gastronomy will not change.

Keywords: organic farming, organic food, gastronomy, organic certification, project

THE ROLE OF PROTECTED AREAS IN THE PRESERVATION OF BIODIVERSITY

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Thanks to a favorable climate, man managed to become a dominant species in a relatively short period of time, relying on biodiversity. Since its creation, it has been a part of nature, but during the second half of the 20th century, it began to adapt nature and the environment to its needs. The expansion of human activities has led to a conflict between human civilizations and the environment, the consequences of which are transmitted through all ecosystems. Throughout history, the environment has varied in time and space depending on complex ecological conditions, however, changes that took place over millions of years are now taking place within a century. The number of animal species today is declining between 1,000 and 10,000 faster than past extinction rates. Protected areas are one of the most frequently used tools in the protection, preservation and improvement of biological, geological and landscape diversity. Depending on the national legislation, the ways and forms of protected areas vary from country to country, but they all have a common commitment to the timely prevention of human activities and activities that can lead to the permanent impoverishment of the aforementioned diversity and the recovery of damaged parts of nature and landscapes. Preservation of the biosphere is the problem of the entire humanity, on which not only our further progress depends, but also the preservation of the basic conditions of life.

Keywords: biodiversity, protected areas, preservation, animal species, environment.

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Section 1

GREEN AND CIRCULAR ECONOMY AS THE BASIS OF SUSTAINABLE DEVELOPMENT

Sekcija 1

ZELENA I CIRKULARNA EKONOMIJA KAO OSNOVE ODRŽIVOG RAZVOJA

AI AND DIGITAL TRANSFORMATION OF THE URBAN ENVIRONMENT TO ACHIEVE THE OBJECTIVES OF THE GREEN ECONOMY

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specialist of the 1st category of the department of FSBI NIIR (Federal State Budgetary Institution Order of the Red Banner of Labor Radio Research and Development Institute named after M.I. Krivosheev)

Among the Sustainable Development Goals, Goal 3 "Good Health and Well-being", which is supposed to eliminate all preventable and premature deaths, and Goal 11 "Sustainable cities and communities", play an important role. Progress towards these goals can be realized through the creation and implementation of digital systems that process citizen data in digital form, using special software, performing machine learning, using AI-technologies. The realization of such goals causes the individualization of the services offered. The principle of «everything as a service» is becoming fundamental for the digital economy. The task of building systems for the provision of mass individualized services without the use of artificial intelligence is unsolvable in principle.

An example of the future-oriented system with the use of artificial intelligence that implements sustainable development goals 3 and 11 in their interrelation is the system for providing a mass individualized service for managing the rescue of a subscriber in emergency situations, which is being developed at FSBI NIIR (Federal State Budgetary Institution Order of the Red Banner of Labor Radio Research and Development Institute named after M.I. Krivosheev). This mass service will allow subscriber to receive his/her individualized self-evacuation route from the emergency zone. When building a green economy and introducing mass services using artificial intelligence, it is important to take into account the issue of ensuring the protection of the rights of citizens. It is necessary to improve the regulatory framework by defining the subject of responsibility for the AI-systems.

Keywords: green economy, digital transformation, emergency situation, artificial intelligence

EUROPEAN GREEN DEAL AND TRANSPORTATION: GOALS AND ACTIONS TOWARDS SUSTAINABILITY

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Abstract: One of the leading initiatives of the European Union to combat climate change is the European Green Deal. Since one of the main goals of this document refers to the drastic reduction of greenhouse gas emissions, key measures include those that accelerate the transition to sustainable and green mobility. This paper analyzes the measures and activities that, in order to achieve the set goals, are foreseen for the transport sector. Special attention in the paper will be devoted to emission trading schemes as one of the key tools for reducing greenhouse gas emissions.

Keywords: EU, transport, emissions, decarbonisation, sustainable development

THE CONTRIBUTION OF THE ENERGY TRANSITION TO THE GREEN ECONOMY DEVELOPMENT IN THE REPUBLIC OF SERBIA

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During the last few decades, the green economy has become a key instrument for realizing the concept of sustainable development. Preservation of natural resources, their evaluation in the process of transformation into final products, as well as environmental protection are the key goals of the green economy. Energy is an economic activity that has been identified as the main anthropogenic cause of environmental pollution and uncontrolled consumption of natural resources, so the energy transition is emerging as one of the key issues of the green economy. In addition to environmental advantages, the energy transition also causes numerous economic changes and benefits, such as: the creation of new jobs, the introduction of eco-energy innovations, the inflow of green investments and the creation of a sustainable economic system.

The aim of this paper is a introduction with the achieved level of energy transition in the Republic of Serbia. The role of the renewable energy resources in the energy transition was analyzed in particular, taking into account their unutilized resource potential. The results of the research show that the use of renewable energy resources in the Republic of Serbia is quite modest, with the exception of the use of the hydro potential of large rivers, which has slowed down the energy transition considerably. The contribution of the paper is reflected in giving concrete proposals in terms of how to improve the energy transition, primarily which forms of new renewable energy resources to use more intensively in the upcoming period and how to increase energy efficiency, with the aim of stimulating the green economy development.

Keywords: energy transition, green economy, development, Republic of Serbia

ORGANIC AGRICULTURE AS A FACTOR IN THE DEVELOPMENT OF GREEN ECONOMY

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The green economy encompasses a variety of green practices, including green agriculture. At the same time, the organic agriculture is one of the determinants for the green economy development, as both theory and practice point to. Accordingly, the subject of research in this paper is the contemporary role and importance of organic agriculture in the development of green economy. The aim of this research is to determine in which direction organic agriculture is developing in the world today and to what extent it affects the realization of green economy concept. The paper is based on the following hypothesis: If organic agriculture develops more dynamically, a faster development of the green economy is also encouraged. Hence, this research uses the official statistical data related to the identified problem area, as well as relevant publications by renowned authors and international organizations. The results of this research indicate that, globally, the organic sector needs to be strengthened, because such an approach encourages the development of green economy, as a factor of sustainable development and solving global environmental problems.

Keywords: organic agriculture, healthy food, green economy, ecology, sustainable development.

COMPLIANCE OF FISCAL AND ENVIRONMENTAL POLICY IN SERBIA AS A CONDITION FOR SOLVING ENVIRONMENTAL PROBLEMS

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The importance of environmental issues is reflected in the level of development of environmental awareness. The citizens of Western Europe recognized the importance of environmental issues in time, which cannot be said for Serbia. This is best reflected through the number of mandates that green parties receive in national elections and through participation in the executive branch. In a large number of European countries, the number of green parties that make up the government is increasing, and the number of "green" deputies is also increasing in the European Parliament.

In order to successfully solve environmental problems, it is necessary to establish an environmental policy that is applicable in the conditions in which our country is. In Serbia, as in other post-socialist countries, it is necessary to strengthen existing institutions and establish new ones in order to adapt the environmental policy to the European one. Environmental standards are expensive both for the state and for industry, for companies that need to adjust production costs, for citizens who pay environmental taxes.

The implementation of the environmental policy is conditioned by the fiscal policy, which with tax instruments - environmental taxes - affects the reduction of pollution and motivates investment in the environment. It should be noted that a successful system of environmental taxation means both targeted and planned spending of collected funds.

The goal of the paper is to show the need for fiscal and environmental policy coordination in solving environmental problems, that is, how much the implementation of these policies depends on strong and stable state institutions, professional people, and financial resources. Everything together forms a condition for making strategic decisions, necessary for the implementation of European environmental regulations before joining the EU.

Keywords: green economy, fiscal policy, environmental policy, global environmental problems, environmental taxes

GREEN EMPLOYER BRANDING AND COMPANY ATTRACTIVENESS FOR CONSUMERS IN THE DIGITAL AGE

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The purpose of this paper is to demonstrate how, in the digital age, developing a green employer brand affects a company's attractiveness in the consumer's view. Consumers in the digital age have high demands and expectations from businesses, particularly in terms of sustainability and environmentally friendly behaviour. Companies must develop and maintain the concept of green employer brand in order to attract consumers who are well informed in the digital age as a result of advancements and widespread use of modern information technologies and tools. Green employer branding encompasses an organization's positive attitude toward environmental protection. It is a collection of various practices and policies concerning the sustainable use of natural resources and energy, waste management, and pollution prevention, which improves the company's image and reputation, increases its attractiveness in the consumer's view, and influences their decision to purchase a product or use a service. Companies can gain and maintain a long-term competitive advantage in this manner, while also respecting the environment and the principles of sustainable business.

Keywords: green employer brand, sustainability, eco-friendly behaviour, consumer behaviour

THE IMPORTANCE OF THE EUROPEAN GREEN PLAN FOR CONSUMERS IN THE WESTERN BALKANS

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The European Green Deal represents a growth strategy, which has as its main goal the transformation of the EU into a modern, competitive society, whose economic progress will be separated from the depletion of society's resources. In this regard, it is necessary to reform policies related to energy, industry, production, consumption, large infrastructures, etc. The main focus of the European Green Deal is biodiversity, from bottom to up, sustainable agriculture, clean energy, sustainable industry, construction and renewal, sustainable mobility, pollution removal and climate action. Furthermore, it is significant to point out that this process of transformation cannot be fully realized without the Western Balkans countries. The aim of this paper is to analyze the activities foreseen by the Green Agenda, which includes the integration of the Western Balkans into the EU industrial supply chains, the analysis of measures to improve the sustainability of production, taking into account the life cycle of products, the analysis of the implementation of consumer-oriented initiatives, which aim to raise the awareness of citizens about the separate waste collection and sustainable consumption. Finally, the Communication of the European Commission, "A New Deal for Consumers", which foresees minimum requirements for manufacturers on mandatory information for products placed on the market, will be considered.

Keywords: European Green Deal, Green Agenda for the Western Balkans, New deal for consumers

GROWTH OF THE GREEN ECONOMY THROUGH THE GROWTH OF SUSTAINABLE TOURISM AND ECOTOURIS

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Green Economy has seen growth in recent years thanks to various models: ethical banking, green finance, green investments and so on. Green Economy strives to be ecologically "more friendly" towards the environment and at the same time to be more responsible both towards nature and towards society. It is more ecologically responsible and modern with the aspiration to influence the even development of all layers of society and local communities, trying to influence the reduction of poverty. Following these trends, the economic branch of tourism is also developing its new forms of ecotourism and sustainable tourism. Tourists themselves feel the need to spend as much time as possible in a natural environment that is rich in biodiversity and clean resources (water, air, soil, energy, etc.). Sustainable tourism supports and has the same elements as the concept of sustainable development: economic development, socio-cultural development and environmental protection. Ecotourism, as a modern form of sustainable tourism, is the fastest growing part of tourism, but at the same time it brings income from foreign tourists, creates employment opportunities for the local population, promotes and educates in the direction of increasing environmental responsibility, preserves nature and encourages selfsustainable management of public and private land. The incomes brought by ecotourism are constantly increasing and thus have a positive effect on economic growth, i.e. on the growth of Green Economy. The popularity of ecotourism, which leads to its massiveness, can negatively affect the tourist destinations where it takes place, because a greater number of tourists leads to greater pressure on the natural environment, and this pressure can have completely opposite effects from those that make the essence of ecotourism. That is why it is necessary to develop environmental responsibility on tourist offers and tourist demands. Touroperators and large companies should take care of the certification of their offer and that ecotourism is not a change in marketing but an essential change in the performance of activities. The government, international institutions and professional tourism associations have a role to define what is ecological and sustainable tourism and what is not, and in that direction to ensure the classification and certification of the destination or touroperator.

Keywords: Green economy, ecotourism, sustainable tourism, responsibility, income, certification

ECOTOURISM ON SALAŠ FARMS IN VOJVODINA AS A GREEN ECONOMIC ACTIVITY

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The green economy is becoming a norm in the business operations of companies of various economic activities, and has also found its application in tourism and hospitality. In efforts to make the green economy more ecologically responsible, various types of tourism were first developed, which support such a concept, but also types of accommodation facilities, branches of traffic and means of transport, and agricultural products which follow the concept of sustainable development. The mentioned concept strives for the sustainability of nature and development that positively affects society and the environment, and ecotourism certainly has a decisive influence in this. The tourism offer of Vojvodina salaš farms and their revitalization can have multiple positive effects, not only for households (owners of farms), but also for local communities, as well as the entire rural area. The main goal of the paper is to determine, on the basis of a survey, whether traditional combined with modern trends in tourist movements can be a strong motivating factor for attracting tourists to Vojvodina salaš farms. The focus is on determining the impact and role of ecotourism and the green economy by researching salaš farms which, according to various criteria (accommodation capacity, offer of organic agricultural products, ecotourism...), are declared as green, and indicates which among them have significant potential. The results can serve as a useful guideline for managers of the tourism and hospitality industry to conceive or innovate such an offer and successfully market it on the domestic and international tourism market.

Keywords: hospitality facilities, salaš farms, sustainable development, ecotourism, green economy.

ORGANIZATIONAL IDENTIFICATION, GREEN IDENTITY, AND INTERNAL (GREEN) MARKETING IN THE CONTEXT OF ENVIRONMENTAL PROTECTION

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The aim of this paper was to present organizational identification, green organizational identity, internal marketing and internal green marketing - their importance, common focus, and the nature of the relationship in the context of environmental protection. The analysis of relevant literature was used for the stated goal.This analysis showed that majority of studies have examined the relationship between organizational identification and employees' attitudes and behaviours, including eco-friendly behaviour, rather than the relationship between organizational identification and perceived service quality, other consumer outcomes, organizational performance or its environmental performance. The role of green organizational identity is important because it can encourage the development of environmental awareness of managers and employees as well as their eco-friendly behaviour. At the same time, there is not much empirical research on the relationship between internal marketing efforts and external marketing outcomes. Hence, a common feature of organizational identification studies and internal (green) marketing studies is that their influences on employees have been tested more. In addition, organizational identification research in the internal marketing context is still rare. Finally, there is a lack of studies on the effects of internal green marketing on employees, organization and environment. The analysis showed that it is very important that managers are highly identified with their organization and committed to internal (green) marketing. Considering that internal (green) marketing programs can improve employees' identification with the organization, and that employees' identification with the organization can improve employees' eco-friendly behaviour, organizational identification should be more present as the research topic in the field of internal (green) marketing and as a management tool in the environemtal protection management.

Keywords: organizational identification, green organizational identity, internal marketing, internal green marketing, employees' eco-friendly behaviour

SMALL AND MEDIUM-SIZED ENTERPRISES AS THE BACKBONE OF THE DEVELOPMENT OF ORGANIC PRODUCTION IN THE REPUBLIC OF SERBIA

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Organic production, as an innovative approach in agricultural production, is based on promoting a healthy agrosystem, biodiversity and biological cycles, emphasizing the rational use of natural resources and the application of scientific knowledge in this area. The production of food products that contain a large amount of harmful substances, and which, on the other hand, are primary in the nutrition of humans and animals, permanently highlights the fact that national economies have so far paid attention to the economic aspects of production, not the ecological ones. Namely, the high level of environmental concerns, along with the hyper production of agricultural products, obliged numerous food producers, and consequently also small and medium-sized enterprises (SMEs), to reorient to alternative ways of production, where a special place belongs to the production of ecologically healthy food. The aim of this paper is to investigate the importance of small and medium-sized enterprises (SMEs) in organic production. Considering that in the agricultural policies of numerous countries, the increase of the area under organic production is stated as one of the primary goals of development, it is clear that small and medium-sized enterprises can realize multifunctional advantages in this way, which especially refers to a more rational use of natural resources, reducing unemployment, but and to achieve higher revenues in business due to the high prices of organic products on the market.

Keywords: organic production, small and medium enterprises (SME), national economy, Republic of Serbia.

THE ROLE OF GREEN INNOVATIONS IN A CONTEMPORARY AND COMPETITIVE ENVIRONMENT

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We are witnessing more and more climate changes, as a result of which the ecological scientific discipline is becoming the subject of many current researches, observed from different aspects. Certain macroeconomic factors, such as green growth and economic globalization, occupy a significant place on the way to achieving environmental sustainability, where green innovations play an integral role. Although eco-innovation is an area of research that is still in its infancy, it is increasingly the subject of interest from both academics and practitioners on the one hand, and policy makers on the other. The aim of this paper is to define the terms green innovation, eco-innovation and environmental innovation based on the current review of the literature, as well as to determine whether there are overlaps in the interpretation of the mentioned terms. Also, by identifying the most active scientists and relevant publications, the paper aims to contribute to the interpretation of the concept of "green innovation". And at the very end, the authors tried to show the importance of green innovations in today's changing environment and their impact on modern business and maintaining a competitive advantage. It is important to work on raising the awareness of activists of governmental and non-governmental organizations, trade unions and the media, small and medium-sized enterprises, as well as large companies, about the potential of economic development based on the green economy, that is, on green innovations.

Keywords: green innovation, eco-innovation, environmental innovation, green productivity growth, green economy

SUSTAINABLE PRACTICES AND COMPETITIVENESS OF AGRICULTURAL ENTERPRISES

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The competitiveness of domestic agricultural entities has improved recently, but is still at a low level. The system of sustainable agriculture is gaining importance, thanks to the growing demand for quality food products, financial incentives and the development of environmental awareness.
The aim of the paper is to assess whether sustainable practices affect the competitiveness of agricultural enterprises in the Republic of Serbia.
A qualitative research approach is used to study the relationship between sustainability and competitive advantage. Data collection was carried out using a semi-structured interview with the owner of an agricultural enterprise.
The results revealed that the agricultural enterprise practices sustainable production practices. The focus is on the economic and ecological dimensions of sustainability, without neglecting the social component. The two motives were drivers of sustainability, business culture and market trend. Sustainability, in the opinion of the interlocutors, is not such an expensive investment, because high initial investments are compensated through higher incomes and brand building. Thus, sustainability leads to growth without increasing costs, which is a source of competitive advantage.
A differentiation strategy based on sustainable practices boosts the competitiveness of agricultural entities. Anyone who practices sustainable practices has an easier time getting quality workers. A cost leadership strategy does not encourage competitive growth, as all manufacturers have similar technologies and costs.
There is a noticeable increase in the importance of sustainable agricultural practices. The research also made it possible to understand that it is possible to establish a relationship between competitive advantage and sustainable practices.

Keywords: sustainability, competitiveness, agriculture, enterprise.

DIGITAL MARKETING AS SUPPORT IN NEW VENTURE DEVELOPMENT

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New venture development is a complex and dynamic process of business opportunity identification, resource generation, and creation of a business plan, model, and strategy. The above-mentioned activities are carried out with a focus on the optimization of internal processes and capacities, but relations with the external environment are equally important for the venture's success. A significant section of the business plan is the marketing plan, specifying the approach to the presentation of the product on the market, the methods of communicating with customers, and promotion adapted to the target segments. The expansion of all forms of business on the Internet in recent years has resulted in the emergence of many modern marketing methods in the digital business environment. Their effective application has significant effects in terms of better visibility of the venture, improvement of sales, and market expansion by acquiring new loyal customers. The research subject is the role and contribution of modern digital marketing methods to the process of establishing and developing a new entrepreneurial venture. The main research goal is to determine which methods of digital marketing contribute the most to the success of different types of entrepreneurial ventures, with a review of their advantages and potential disadvantages. The paper evaluates the application of digital versus traditional marketing methods in the process of developing a new business venture and offers guidelines for further research.

Keywords: entrepreneurship, new venture, digital marketing, business plan

ECONOMIC INSTRUMENTS FOR IMPROVING WASTE MANAGEMENT

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Waste management involves a series of procedures and procedures that must be followed. Unfortunately, some parts of Serbia lag behind in procedures and procedures and are still at zero point. This paper will discuss waste management in the territory of the City of Novi Sad. We will base that part on the experiences gained from the project "Analysis of energy efficiency in the territory of the City of Novi Sad" which was carried out during 2019 and 2020. and it was presented in October 2022. organized by the City Administration for Environmental Protection of the City of Novi Sad, where the first author was a researcher.
Economic instruments are a category of instruments that aim to influence the behavior of society as a whole, by applying financial incentives in order to improve the management of the environment and natural resources. The paper will propose economic instruments to solve these problems. They are based on the "polluter pays" principle and the independent covering of costs, primarily by public services for waste treatment. The work will also deal with the identification of sources of funds for financing investment activities and the need for legislation that will define this area.

Keywords: economic instruments, environmental problems, circular economy, waste management, recycling

THE IMPORTANCE OF DIGITIZATION FOR THE SUSTAINABILITY OF DIFFERENT SECTORS OF THE ECONOMY

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Digitization and the sustainability of the economy are two important and related topics that make up world trends and are currently shaping the future of the global economy. Digitization in the economy implies increased use of digital technologies in order to increase the efficiency of work processes. The fourth industrial revolution essentially represents the digital transformation of the economy and society through the use of artificial intelligence, robotics, the Internet of Things and advanced analyzes of large amounts of data. In this new industrial revolution, popularly called industrial revolution 4.0, traditional fixed assets, i.e. capital, lose their importance. It is most important resource is starting to be people, that is, applicable knowledge and creativity, which represents a chance for developing countries to catch up with more economically developed countries. Digitization and sustainable development are mostly complementary terms. Sustainable development implies the ability to meet the needs of the current society, without endangering future generations and their needs. Viewed from another angle, digitization could be a means, while sustainable development would be the goal to be pursued. By combining these two complementary In 2015, the United Nations adopted the goals of sustainable development, which rely terms, a new term has recently appeared in the professional literature “digitainability”. on digitalization and the green economy. These are also the goals of the European Commission, adopted in the post-Covid period, 2020. These goals relate to decision-makers, companies and society as a whole, and the first results of the implementation of the goals are already being felt.

Keywords: digitization, sustainability, green economy, industrial revolution 4.0, digital sustainability, strategic goals

CIRCULAR BIOECONOMY AND ITS SIGNIFICANCE IN PRESERVING NATURAL RESOURCES IN SERBIA

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The linear economy model applied so far in Serbia obviously leads to degradation of the natural environment and irreversible consumption of natural resources, without the possibility of renewal.

Various strategic, legal and institutional frameworks in Serbia define the concept and importance of the circular economy, while the concept of bioeconomy itself is not recognized and there are no Bioeconomy Strategies and Action plans for the development and establishment of the circular bioeconomy. The basis of the circular bioeconomy lies in sustainability. Extending the life of products after repair and recycling, composting biodegradable waste, using biomass from both agriculture and forestry, and reusing certain products are just some of the models that show how economic and social benefits can be achieved while reducing the consumption of natural resources. Since September 2022, the Institute of Forestry from Belgrade with its team of experts has been involved in the implementation of the CEE2ACT project (Empowering the Central and Eastern European Countries to Develop Bioeconomy Strategies and Action Plans), in which 17 European countries participate. The Project is financed by the Fund of the European Union program for research and innovation Horizon Europe. The objective of CEE2ACT project is to empower countries in Central and Eastern Europe (Hungary, Bulgaria, Croatia, Czech Republic, Poland, Romania, Slovakia, Slovenia,) and beyond (Greece and Republic of Serbia) to develop circular bioeconomy strategies and action plans, through knowledge transfer and innovative governance models, to achieve better-informed decision-making processes, societal engagement, and innovation, building on the practice of experienced countries (Austria, Belgium, Finland, Germany, Netherlands, Spain, Sweden).

Adoption and implementation of the National Bioeconomy Strategy and Action plans for the implementation of sustainable and circular bioeconomy, formation of the National Bioeconomy Hubs (NHB), support and financial incentives for those entrepreneurs who respect the principles of circular bioeconomy and sustainability, improvement of technological processes within the activities of agriculture, forestry and other activities are only some of the measures that must be implemented in Serbia in order to establish a circular bioeconomy model. NBH should provide various trainings, provide an insight into examples of good practice and enable the creation of business partnerships and the interconnection of different actors of the bioeconomy in order to optimize the use of resources and raw materials and reduce the amount of waste. The paper will present the CEE2ACT project, the goals and initial results of the analysis of the state of the bioeconomy in Serbia.

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GREEN ECONOMY THROUGH THE PRISM OF DIGITAL TRANSFORMATION

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For several decades now, the key issues in the development of the global economy and societies in general have been those related to the potential of information and communication technologies, i.e. digitalization and the challenge of sustainable development and environmental protection. Today, technology is a key factor in achieving a balance between the development of society and the natural environment.
Industry 4.0 - level in technological development is a combination of physical means and advanced digital technologies. In this context, it creates new patterns of production and consumption and brings about great changes in all spheres of society and economy. The widespread use of digital technologies has created hope that environmentally friendly production methods will enable economic development. Although the social and environmental impacts of the digital transformation are yet to be seen and it is difficult to predict what impact they will have on the environment, some initial trends can already be seen.
The paper will analyze the possibilities of harmonizing the process of digital transformation of enterprises with the goals of sustainable development.

Keywords: Green economy, sustainable development, digital transformation, Industry 4.0.

CURRENT ASPECTS OF ENVIRONMENTAL AND ENERGY SECURITY IN THE STRATEGIC FRAMEWORK OF THE DEVELOPMENT AND FUNCTIONING OF THE GREEN ECONOMY

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The contemporary trend of application and development tendencies of the green economy impose strategic frameworks of economic activities and development, which in current conditions are particularly reflected in three basic dimensions: (a) economic; (b) environmental; and (c) energy dimension of different forms of production. The economic dimension is the starting point, because it refers to the consideration of various production costs and the economic evaluation of the material production in question, that is, the final market product. The environmental dimension refers to the reduction of the impact on the production and especially the environment, on all three mediums, that is, on soil, water and air, and consequently on the living world in the surroundings. In terms of production and process, it is particularly important to achieve a certain level of environmental security, for the sake of safely performing production processes for various products and services, but also for the safe development of work and life processes of human, plant and animal organisms. The energy dimension is particularly important in current conditions, especially due to the newly emerging energy and economic crisis, after the beginning of the Russian-Ukrainian military conflict and the strategic reduction of the EU's energy dependence on Russian oil and gas as key energy sources, which directly affects the accompanying issue of energy security. The green economy is aimed at reducing the use of fossil fuels for obtaining energy, and in the direction of increasing the participation of sustainable energy sources, in order to reduce carbon emissions, raise the level of energy security and increase the level of environmental security multiple times, with accompanying costs and profitable economic effects.

Keywords: ecology, environmental security, energy security, material production, green economy

GREEN ECONOMY – THE ECONOMIC GROWTH DRIVER AFTER COVID-19 PANDEMIC

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The paper presents the role and importance of the green economy in the process of overcoming the negative consequences caused by the Covid-19 pandemic in the world. The aim of the work is to point out the significance and importance of the green economy as well as the necessity of applying the green economy in the function of sustainable economic development as a driver of economic development. In the paper, the authors present the situation in the Republic of Serbia by analyzing green consumption and green production in the Covid-19 crisis. Authors point out that it is necessary to strengthen the regulatory framework, formulate new strategies and action plans which include the concept of green economy, improving the green economy dimension in population in order to achieve a growth trend of the domestic economy.

Keywords: green economy, economic growth, sustainable economy, Covid-19.

CIRCULAR ECONOMY AND BANKING INDUSTRY IN THE DIGITAL AGE: CASE STUDY OF ERSTE BANK A.D. NOVI SAD

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Abstract: Circular economy, as a concept that requires a multidisciplinary, holistic approach, as well as involvement of many different stakeholders, is becoming the subject of interest not only in the wide academic community, but also practitioners. One of the factors that greatly contributed to the development of the circular economy is modern digital technologies and their massive application. The aim of this paper is to point out the role and importance of the commercial banks in the application of circular economy in the digital age. Among various stakeholders in the Republic of Serbia, commercial banks, as the most important segment of the financial sector, should be specially emphasized. Banks have already included the aspect of energy efficiency, environmental protection, and other areas that speed up the development of the circular economy in their credit risk policies. On the one hand, commercial banks need to provide sufficient funding to circular businesses, while on the other hand they need to make internal transition from a linear toward circular economy. The key conclusion is that engagement of commercial banks in the circular economy in the digital age contributes to the socially responsible behavior, as well as to the greater profitability and competitiveness.

Keywords: digital age, digital technologies, circular economy, social responsibility, banking industry.

GREEN ECONOMY AND QUALITY OF SERVICES IN RETAIL

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Retail is facing increasingly pronounced competition on the one hand and increasingly demanding consumers on the other. Because of this, retailers strive to improve the quality of their services and thus meet and exceed consumer expectations and form a competitive advantage. Thoughtful and wise business is necessary, which first of all implies a reduced and rational consumption of resources and the creation of a more ecologically valuable business environment. Services as an integral part of the offer have a significant impact on ensuring customer satisfaction in retail. There is a high degree of interdependence between retail and service quality, because providing high-quality service can help retailers differentiate themselves from others, with a high dynamic of achieving long-term success and competitive competitiveness, which largely has a significant dynamic of retail competitiveness.
All types of organizations, including retail companies, are increasingly trying to achieve and demonstrate their performance in environmental protection by controlling the impact of their activities, products and services on the environment, in line with their policies and environmental protection goals. They act in this way in connection with increasingly strict legislation, the development of economic and other measures, which require environmental protection and the increasingly expressed concern of interested parties for the issue of environmental protection, sustainable development and green economy.

Keywords: green economy, service quality, dimensions of service quality, retail

A HOLISTIC APPROACH IN ESTABLISHING A MODEL OF A SUSTAINABLE ECONOMY: NATIONAL AND THE EUROPEAN PERSPECTIVE

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Today is marked by great challenges, both in scale, scope and urgency, such as climate change, biodiversity loss, extreme poverty and social inequality. These problems are multiple, complex and diverse and by nature intertwined in the framework of environmental protection and health, as well as in the social and economic spheres. Environmental pollution is becoming more pronounced and the consequences of inefficient resources use are mounting. Desired economic development and a sustainable economy should be accompanied by adequate measures, which will mitigate the consumption of natural resources and enable sustainable production with minimal damage to the environment. The strategic commitment to the development of the circular economy and meeting the goals of sustainable development imposes the need of the economy for innovative approaches in resource utilization and reduction of risks to the environment and human health, while not neglecting the social component of sustainable development and fostering more sustainable consumption patterns. Only a holistic approach, with a systemic value orientation towards sustainability, can enable the harmonization of confronting social goals.

Keywords: sustainability, circular economy, sustainable economy, holistic approach

POLITICAL SCIENCE APPROACH TO THE STUDY OF THE ROLE OF "GREEN ECONOMY" IN CONTEMPORARY ENVIRONMENTAL POLICY: ANALYSIS OF PERFORMANCE IN SERBIA AND THE EUROPEAN UNION

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The first two decades of the 21st century are marked by three dynamic processes that are manifested in changes and development, primarily of the consumer society, expressed environmental awareness of citizens, as well as increased interest of the economy in further quantitative growth. This quantitative growth today is a combination of classical quantitative growth but harmonized with the ideas of sustainable development and saving natural resources. In that sense, the economy, ie the business sector, becomes a collaborator and not an opponent of modern environmental policy. The reasons for this turn are in the fact that the "green economy" is becoming a new profitable activity that now contains environmental awareness and thus controls and limits consumer ideology. The paper presents a sociological and political analysis of the idea of a "green economy" and the possibility of its harmonization with the theoretical concept of modern environmental policy and the idea of sustainable development. Also, the paper contains an analysis of the applicability and success of the "green economy" in the environmental policy of the Republic of Serbia and the European Union.

Keywords: "green economy", sustainable development, recycling, waste, environmental policy

MANAGEMENT ASPECTS OF GREEN ECONOMY AND GREEN GROWTH

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The world is trying in various ways to build a system of sustainable production and consumption, and ecology leaves a deep mark on the economy. Emphasis is placed on the production of the greatest possible added value with the least possible consumption of materials and energy and with the least negative consequences for the environment, in order to protect future generations. Today, natural disasters and health pandemics are becoming more frequent, and their consequences are enormous. In many countries, even with a developed economy, it becomes difficult to restore nature and the economy in a short period of time. The ecological crisis shows that it related its risks to the overall development of each country, so it is necessary to increase awareness of the consequences of climate change. This paper starts with the thesis that environmental problems have not decreased, but are increasing, and deals with the analysis of sustainable development with special reference to the consequences of natural changes, which have a devastating effect on the green economy.

Keywords: green economy, economic effects, green growth, ecologic management

PRODUCTS WITH PROTECTED INDICATION OF GEOGRAPHICAL ORIGIN: POTENTIAL OF RURAL AND REGIONAL DEVELOPMENT OF THE REPUBLIC OF SERBIA

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Products with a protected designation of geographical origin, thanks to their characteristics (price, quality and reputation), can significantly contribute to the more efficient development and increase in the well-being of the national economy. Namely, these products, on the one hand, by achieving premium prices on the market, enable an increase in the employment and income of local producers, encourage the development of the activity to which they belong and contribute to sustainable development (including all its dimensions - economic, social and environmental dimensions), above all, rural areas. These products at the same time, represent a significant potential for achieving more even regional development since these products achieve added economic value, as and a whole range of other advantages (cultural, ecological and others). On the other hand, consumers receive a quality product that is produced in full compliance with the appropriate quality standards, with minimal occurrence of information asymmetry. In accordance with the above, the aim of this paper is to, along with the previous presentation of the concept of protection of the designation of geographical origin of the product, look at the importance that these products can have as a potential of rural and regional development of the Republic of Serbia.

Keywords: Products with a protected designation of geographical origin, the concept of protecting the geographical origin of products, rural development, regional development.

EVALUATION OF THE ENVIRONMENTAL SUSTAINABILITY OF THE BALKAN COUNTRIES BY ANALYSING THE ENVIRONMENTAL PERFORMANCE INDEX

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Sustainable development is a very important concept of the modern age. One of the dimensions of sustainable development that is the most present and current topic in world debates is the environmental dimension. The most reliable indicator of the environmental sustainability of countries is considered to be the Environmental Performance Index. This composite index ranks countries according to the degree of achievement of environmental sustainability. The latest report from 2020 covers 180 countries. Among them are the countries located on the Balkan countries, namely Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Montenegro, Northern Macedonia, Romania, Serbia and Slovenia, which are also areas of research in this paper. The data used in the research are part of the database available on the official website of the Environmental Performance Index (https://epi.iale.edu) and refer to the values from 2020. Objectives of the research can be formulated as follows: 1) Establish a correlation between the values of the Environmental Performance Index with components and the areas of environmental policy of this index, 2) Define the groups of interrelated elements that have the greatest impact on the value of this index. Using correlation analysis, a significant statistical agreement was found between the EPI index and its components (Environmental Health and Ecosystem Vitality) as well as the EPI index and environmental policy areas. The application of factor analysis, on the other hand, has enabled the identification of three important factors that can be identified as air and water quality, pollution and reduced use of ecosystem services.

Keywords: Environmental Performance Index, Sustainability Concept, Balkan countries.

SUSTAINABILITY AND GREEN ECONOMY FRAMEWORKS

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According to international experience, implementing conceptually novel management tools based on integrated approaches to the notion of sustainable development can increase the level of environmental safety of the national economy. The goal of the study is to generalize and systematize existing conceptual approaches to the definition of this notion in order to clarify the meaning and content of the phrase "green economy." The research was carried out using general scientific methods, including classifications to systematize theoretical approaches to the definition of "green economy," which are proposed by various scientific schools. Furthermore, structural and logical generalization to clarify the terminology, analysis and synthesis to summarize the existing conceptual approaches and green economy frameworks was conducted. The paper gives an insight into how the green economy develops, as well as the conditions necessary for its construction and the difficulties it faces. The various scientific definitions of the "green economy" are analysed and summarized. Based on findings, this paper gives recommendations for the "green" transformation.

Keywords: green transformation, integrated strategy, integrated logistics system, green growth

CIRCULAR ECONOMY AS AN IMPERATIVE OF SUSTAINABLE DEVELOPMENT IN NORTH MACEDONIA AND SERBIA

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Abstract: The circular economy is the antithesis of the current linear model of an economy based on uncontrolled exploitation of natural resources and flow of materials (factory - user - landfill). The principle of the linear economy has a take-do-throw base, while the circular economy has a wider take-do-fix-reuse-recycle base. There is a great need for a circular economy in the world, with recycling being considered the leading instrument of this model of economy. Therefore, the aim of our work is to show that the circular economy is imperative for sustainable development in North Macedonia and Serbia. The paper is conceived in three parts. The first part is based on the analysis of the advantages of circular economy in the countries of the European Union. The second part presents the circular economy as a chance for sustainable development of the Republic of North Macedonia, while the third part is based on the circular economy as a required condition for sustainable development of the Republic of Serbia. The methodology used in this paper is based on qualitative research techniques, i.e. analysis, comparative analysis, and synthesis. The authors conclude that it is necessary to urgently establish the circular economy model and create an appropriate legal framework in these countries, following the example of leading European countries.

Keywords: circular economy, sustainable development, North Macedonia, Serbia.

AN OVERVIEW OF PHOTOVOLTAIC MODULE'S END-OF-LIFE MATERIAL RECYCLING PATHWAYS

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With rapid increase in production and installation of photovoltaic systems, recycling of photovoltaic modules is becoming more and more important. Given the recently adopted legislation in Serbia that recognises the status of prosumer, it is expected that this technology will proliferate in Serbia as well. In such a scenario, photovoltaic module recycling shall become an important issue. This paper gives an overview of technological photovoltaic recycling processes such as physical separation, thermal and chemical treatment. For each type of process, proven technologies are presented and their advantages and drawbacks are described. The results show that recycling technologies for photovoltaic industrial waste and end-of-life modules are well researched and some are already commercially available, although challenges remain in process efficiency, process complexity reduction, energy requirements and chemical use. The economic viability of photovoltaic waste remains unattainable and incentive policies are still needed to encourage manufacturers to take responsibility. In addition, it is necessary to introduce additional incentives for photovoltaic waste recyclers in Serbia until a constant inflow is established.

Keywords: photovoltaic module, PV waste, close-loop life cycle, recycling, solar potential of Serbia.

CIRCULAR ECONOMY: RECYCLING OF SPORTS EQUIPMENT

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Abstract: Modern sports and environmental protection represent an important component of social development, which, through their inclusion and integration in almost all spheres of life, directly or indirectly affect each human individually. Sport as a phenomenon has a wide range of areas in which it is possible to act in the direction of preserving the environment, among which is the sports industry. The sports equipment industry includes sports clothing, sports shoes and related sports equipment. Recently, this segment of the industry has been developing rapidly on a global level with the aim of satisfying the demand for new, improved and modern sports products. The entire process of this segment of the industry led to the accelerated production of sports equipment in accordance with the lifestyles of users - buyers, but also to an increased percentage of waste disposal, which opened up space for this research. The subject of this paper refers to the circular economy in sports, actually, to the recycling of sports equipment. The recycling of sports equipment represents a model that integrates the function of resources in the sports industry, so that waste from factories becomes a valuable raw material in a new production process, the end product of which will be returned again to any area of sports. The goal of this research is to present a way to preserve the environment by recycling equipment from the sports industry and using used materials and products that can be repaired, reused or improved instead of being discarded. The results of the research showed that the waste generated by the disposal of products from the sports industry, which includes rubber, textiles, plastics, leather, foam, can be used for recycling and the production of materials that can be reused in the form of new materials (products) in the field of industry sports (clothing, footwear, raw materials for sports fields, training grounds, etc.). Sports fields, polygons, surfaces, built on the basis of these recycled materials from the sports industry are increasingly becoming an achievable goal in the planning and implementation of many sports events. Sports federations at the global level take the initiative, plan and implement projects in the function of environmental protection with "zero" tolerance when it comes to environmental pollution. The Union of European Football Associations (UEFA) is among the leading sports organizations that recognize the circular economy as a new concept in football through concrete and practical projects with guidelines that will encourage the action of all participants in football by applying the 4 R principles (reduce, reuse, recycle, recover). In this way, the circular economy in sports, by recycling sports equipment, represents an alternative to the worn-out model of the linear economy, and it refers to the utilization of used resources based on the principles: take-make-use-throw.

Keywords: sport, environmental protection, recycling, sports equipment, circular economy

LINEAR ECONOMY MODEL VS. CIRCULAR ECONOMY MODEL

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In this paper, the authors elaborate on the characteristics of two production models, linear and circular. Linear production is based on the principle of "take, produce, consume and throw away", which shortens the life of waste, and waste is equated with garbage, which means that it is immediately and permanently disposed of in nature. It is characteristic of circular production that the waste is first treated or goes through 4 phases: minimization of solid waste at the place where it was generated (end of production or consumption); recycling; sanitary waste transformation and sanitary disposal. This indicates that in this form of production, the lifespan of waste is longer, and waste can be converted back into raw materials or energy in a new production cycle. As waste as input excludes the exploitation of raw materials from nature as input, the circular production model is much more environmentally friendly than the linear one. On the other hand, a producer who uses recycled waste as a raw material has lower production costs and is thus more competitive on the market. It should be emphasized that recycling and processing are not the same terms, ie that recycling is a method of waste processing. The paper will explain that the recycling process takes place in two ways: 1. Separation of useful and usable parts from integral solid waste or 2. Removal of components that pollute the environment from waste and enable their reuse. The authors tried to present the theoretical elaborations through schemes in order to better present and better understand economic models through visual display. There are cases when it is not possible to replace the linear model with a circular one, and the answer to that question should be provided by the waste management.

Keywords: linear economic model, circular economic model, waste, recycling, raw materials

THE IMPACT OF INTELLECTUAL CAPITAL ON THE BUSINESS PERFORMANCE OF THE GREEN ECONOMY

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In the professional literature, there is a large number of studies that study the impact of intellectual capital on performance. The competitive model in modern business has changed. In this regard, companies achieve their competitive advantage on the basis of IC. Professional literature is based on examples and evidence that confirm the fact that IC affects the growth of companies and business performance. Consequently, the aim of the paper is to assess the impact of IC components on the business performance of companies in the green economy. The company's success is based on their intellectual systems and knowledge-based activities in the development of new products, services and processes. Knowledge management affects the improvement of employee performance, which is an extremely important factor in achieving the company's competitive advantage, and therefore knowledge that contributes to the achievement of the company's basic goals must be viewed as an irreplaceable strategic resource of the company and the green economy. The role and importance of effective IC management, all in order to achieve better business performance in the green economy. Namely, IC represents an important determinant of company performance. The created extra value no longer depends on the quantity, i.e. on the increase of the produced quantity, but on the knowledge that is embedded in the products or services of the green economy. The most developed economies of the world base more than half of their gross domestic product on knowledge. The knowledge-based economy is a term used to describe the global economy. The world economy has been experiencing significant transformations for years. One of the results of such transformations is an increase in the value of intangible assets. Creating a sustainable competitive advantage is based on investments in IC. Professional literature offers numerous studies, however, there is an insufficient number of empirically verified laws that could be unconditionally accepted. Certain studies show that countries that invest intensively in IC do not confirm the statement that IC has influenced business performance. The logical conclusion that emerges is that the way IK is managed affects business performance, that is, that the effects of using IK are not achieved automatically.

Keywords Intellectual capital, green economy, business performance, intangible asstes.

POSSIBILITIES OF APPLICATION OF THE CIRCULAR ECONOMY CONCEPT IN ORGANIC PRODUCTION

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Global warming, reduced ozone layer, turning of fertile land into deserts, occurrence of acid rain, extinction of plant and animal species, increase in amount of waste, greenhouse effect are the challenges facing modern humanity and which question the survival of the ecosystem. Due to the aforementioned problems that intensively increase the risk of permanent damage to the environment, sustainable development as a long-term orientation occupies a primary place on the ladder of goals for preserving the capacity of natural resources. In order to reduce, and in the best case, eliminate, the aforementioned risks, the concept of circular economy was developed - the concept of a green future, which represents the path to achieving long-term sustainability. Energy, construction, industrial production, tourism, waste management, forestry and transport are cited as sectors of exceptional importance for the implementation of the circular economy concept, however, the key and most important sector for the introduction of the mentioned concept is agriculture. Organic production is gaining more and more importance, creating a complete harmony between agricultural production and environmental protection requirements, enabling the population to feed on products created by natural processes using limited substances, and in the end especially because it brings man closer to nature, from which he was obviously born. The aim of this work is to point out the possibilities and obstacles of implementing the concept of circular economy in agribusiness, with special reference to organic production, as well as to point out the positive effects that are achieved by the mutual connection of the concept of long-term sustainability and organic production as an agricultural activity of a green - healthy future. As an example of good practice, Peppermint International from the North of Kosovo, which deals with the organic production of essential oils, herbs, medicinal and aromatic plants and which bases several of its production processes on the principles of the circular economy, is mentioned in the paper.

Keywords: circular economy, organic production, Peppermint International, European Union, Republic of Serbia.

THE IMPORTANCE OF CIRCULAR ECONOMY MANAGEMENT OF PACKING WASTE: THE CASE OF SERBIA

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Circular economy (CE) represents the reduction of the use of resources, the reuse and recycling of all materials so that the smallest percentage of waste is disposed of in landfills. This is precisely why CE, as the antithesis of the linear model of the economy, is considered imperative for sustainable development in the Republic of Serbia, which would lead to a better economic perspective and sustainable economic growth. Considering that in the modern world there is an increasing use of CE, one of the leading instruments is recycling. Therefore, the topic of this paper is the importance of CE in the management of circular waste that can be recycled. Packaging waste is any packaging or material that cannot be used for its original purpose, except for those residues created in the production process. Management of packaging and packaging waste aims to protect the environment while respecting the basic principles of sustainable development. In Serbia, packaging waste consists of the following components: 14% glass, 25% plastic, 34% paper and cardboard, 5% metal, 21% wood and less than 1% waste. While the recycling of packaging waste is supported by only seven operators who manage packaging waste in Serbia, it is considered that the management of packaging waste is on the rise because the national goals for the year 2020, for waste reuse (62.6%) and waste recycling (60%) have been met. Future activities in the management of packaging waste should be focused on continuing the trend of waste utilization and increasing the number of operators.

Keywords: circular economy, management, packaging, waste, recycling, EU Green deal, Serbia

ORGANIC AGRICULTURE AND CLIMATE CHANGE

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Organic production as a factor in preserving the environment should be developed and this production should be promoted. Intensive agriculture is one of the major polluters of the environment, not only due to the use of synthetic means during agrotechnical operations, but also due to the destruction of ecosystems, destruction of wildlife in soil, water and air, uncontrolled production and measures aimed only at increasing yields. Therefore, the preservation of nature is in the background. Organic agriculture appeared in the 1920s as a production that can satisfy the basic needs of people and at the same time contribute to the reduction of pollution during the production cycle. In addition to the principles of ecology, organic agriculture respects the principles of health, equality and care. The fact is that at the beginning of the 21st century, we are facing the consequences of uncontrolled depletion of natural resources and destruction of the environment. Organic production as a factor in preserving the environment should be developed and this production should be promoted. Intensive agriculture is one of the major polluters of the environment, not only due to the use of synthetic means during agrotechnical operations, but also due to the destruction of ecosystems, destruction of wildlife in soil, water and air, uncontrolled production and measures aimed only at increasing yields. Therefore, the preservation of nature is in the background. Organic agriculture appeared in the 1920s as a production that can satisfy the basic needs of people and at the same time contribute to the reduction of pollution during the production cycle. In addition to the principles of ecology, organic agriculture respects the principles of health, equality and care. The fact is that at the beginning of the 21st century, we are facing the consequences of uncontrolled depletion of natural resources and destruction of the environment.

Keywords: organic agriculture, climate, change, sustainability, environmental protection

EFFECTS OF CLIMATE CHANGE ON PROFITABILITY IN CROP PRODUCTION

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The effects of climate change, such as extreme temperatures, droughts, floods, storms, etc., are increasingly worrying farmers. The aim of the work is to find out how income levels and profitability indicators in plant production have changed, and how agricultural farms are adapting to climate change. The literature review deals with climate change and its causes, effects and adaptation strategies available to farmers. The empirical part is based on a quantitative comparative analysis, for which data obtained through a semi-structured interview with two similar agricultural farms for the period 2018-2022 are used. The results show that sales revenues were uneven in the observed period, which was caused by drought and excessive humidity. In 2019, there were many dry periods, so winter crop yields failed. In 2022, the summer was very dry, so very low yields were achieved. The calculation shows that the profit made in all five years is a very variable category, ranging from €5,569 to €183,662 annually. Also, there were years when the change in sales revenue was negative compared to the previous year. It would be important to choose an adequate strategy for adapting to climate change, in order to ensure the stable development of crop production. These include insurance, preference for conventional practices, early sowing, timing of sowing, building up of seed stocks, use of growth regulators, winter crops and more resistant varieties, which farmers have partly practiced.

Keywords: climate change, crop production, sales revenue, profitability.

THE INFLUENCE OF MARKETING MIX PRACTICES ON SUSTAINABLE DEVELOPMENT

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Abstract: The paper aims to find new models of sustainable microeconomic management in order to implement the basic dimensions of sustainable development in the Republic of Serbia, namely: economic growth, social equality and environmental protection. Also, the new models should show a possible link between the elements of the marketing mix and the dimensions of sustainable development, in order to reduce poverty. The results of this study indicate that the classic marketing mix known as "4P", i.e., product, price, promotion and place, is not enough for companies to build social policy. marketing with an impact on sustainable development. The paper explains how and why the goals of sustainable development should be included in the organizational strategy of companies in the Republic of Serbia. The role of the marketing mix "5P" in sustainable development will also be identified, emphasizing the fact that marketing should be the main factor of sustainable development.

Keywords: marketing mix, sustainable development, competitive advantage, corporate social responsibility

GREEN ECONOMY AND CORPORATE FRAUD

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The aim of the paper is to show the correlations between the green economy and corporate fraud in the business model of modern economy. In the first part of the paper, the basic principles of the green economy are presented, as well as criticisms and different views of the way in which it is possible to encourage sustainable development. Basic principles and examples of greenwashing are explained. The risks that appear depending on the measures taken to encourage changes that should lead to mitigating the negative effects of modern climate change are pointed out. The fact that there are many opportunities for committing fraud in the domain of sustainable economic growth was highlighted, with proposals for their prevention and mitigation presented. A comparison of global challenges and solutions as well as those immanent to the local economic environment is presented.

Keywords: green economy, fraud, greenwashing

REGIONAL PRINTED MEDIA AS AN ACTOR OF SUSTAINABLE DEVELOPMENT OF RURAL AREAS

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The presence of issues of sustainable rural development in media has multiple effects on overall development od rural population: socio-cultural, economic, political and environmental. Socio-economic development of rural regions is based not only on improvement of agriculture bat also on creating conditions which would allow the incomes of rural households in the other economic activities. Media by dissemination of useful messages media may contribute to the awareness and education of rural inhabitants and, therefore, directly influence the development of rural communities and regions. It has been known, for a long time, that media are a significant actor in the he process of social changes. The printed media, especially daily newspapers, have a desisive role in this process due to their larger number of published analitycal texts. The objective of this research is to find out the number of articles dealing with sustainable rural development, their frequency of appearance, and the journalist form used on the example of daily Serbian regional newspaper. The research has been conducted, using the regional newspaper *Narodne novine*, in 2022 year (last three months). The method of content analyis, of quantiative-qualitative type, was used and the unit of analysis was each text dealing with rural development. It was identified 179 such newspaper textual unites. It was noticed that the *Narodne novine* covers various topics connected with daily life on contryside, agriculture, diversification of rural economy and environemntal protection.

Keywords: Sustanable rural development, daily newspapers, content analysis, *Narodne novine*, South-East Serbia.

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PLACE OF BIOCULTURAL HERITAGE IN POST COVID-19 TOURISM DESTINATION CHOICE

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Rural space, protected areas, and nature in general become so-called “hot spots” in the tourist perspective in the last two years. The covid-19 outbreak caused growing commercial tourism to have a tendency to transform and go a step far from sustainability to regenerative directions. These changes consider “to rebuild”, “renew”, and “getting back to tradition and roots” where ecosystem services and wild plants in focused. In recent times, several studies of tourists’ behaviors and attitudes towards utilization and interest in wild edible plants have been conducted. This study represents the results of research conducted on 53 tourists and 20 local touristic households in the Biosphere “Golija-Studenica” to explore relationships between wild edible plants utilization/collection and the tourism experience. According to the results, there is an increased interest or demand for wild edible plants by tourists and local people. On the one hand, these demands are the result of long traditions and on the other hand the increased desire for healthy food. Different socio-demographic backgrounds of tourists impact their environmental awareness, knowledge and education on goods and services from nature. This study highlights the need to fulfil ecological responsibility when tourism occurs in ecologically worth areas to achieve bicultural conservation and regenerative approach.

Keywords: biocultural heritage, tourism, wild edible plants.

MULTIPLE-CRITERIA EVALUATION OF THE SMART CITIES CHARACTERISTICS AS SMART TOURISM DESTINATIONS

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Smart cities imply the application of digital solutions with the aim of providing more efficient services, more optimal use of resources, and reducing the harmful impact on the environment. In this sense, smart cities can be treated as potentially attractive destinations in the field of smart tourism. During the development of smart cities, it is necessary to define the factors that need special attention. In this work, a multi-criteria approach based on the PIvot Pairwise Relative Criteria Importance Assessment - PIPRECIA method was applied. A detailed review of the literature defined a list of aspects and corresponding factors that were evaluated by three decision-makers. The obtained results are relevant and authoritative, and therefore the usefulness and applicability of the proposed approach are unequivocally confirmed.

Keywords: Smart cities, smart tourism, PIPRECIA method, group decision making, factors

TRENDS IN THE APPLICATION OF THE CONCEPT OF SMART CITIES IN THE WESTERN BALKAN COUNTRIES

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The concept of creating smart infrastructure, as well as the use of available resources and potentials leads to the idea of creating smart cities. The development of this concept implies the implementation of development trends related to life in the cities of the Western Balkans, but also the development of unique solutions that will assimilate development trends and enable their availability and use by citizens living in the city, which is the basic hypothesis of this research. The subject of this paper includes data collection through a survey of employees in various city administrations in Belgrade, Nis, Kragujevac, Trebinje, Podgorica, Herceg Novi, Skopje, analysis of collected data, and making unique conclusions and solutions to the survey. The aim of this paper is to point out the importance and significance of the concept of smart cities on the basis of relevant literature and available indicators obtained by the research, and to determine the extent to which it is implemented in urban administrations in the Western Balkans. The results of the research indicate that despite the cities in which significant progress is noticeable in the implementation of strategic solutions of smart cities, there are still noticeable problems in their implementation in the Western Balkans.

Keywords: smart cities, Western Balkans, infrastructure.

DEVELOPMENT ASPECTS OF GREEN MARKETING IN REPUBLIC OF SERBIA

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The development of society at the global level is closely related to population growth and accelerated industrialization. There are more and more consumers who, due to good information, demand products with specific characteristics. Among them are those who consider the environmental aspects of the products or services they buy. To survive in the market, companies are forced to adapt to such requirements. This is how the concept of green marketing came about.
This paper presents the concept of green marketing, as a new condition for the survival of companies on the market. As the concept of green marketing implies the existence of green elements of the marketing mix, the paper highlights additional requirements that the elements must fulfil to be characterized as green. The aim of this paper is to systematically present an overview of the development of the concept of green marketing and the conditions that must be fulfilled, as well as to indicate the state of development of green marketing in the Republic of Serbia. The general conclusion reached is that this concept is only in its infancy on the territory of Serbia, and that its greater application is expected in the near future.

Keywords: green marketing, green marketing mix, product, price, place, promotion

HEALTH MARKETING IN THE FUNCTION OF SUSTAINABLE DEVELOPMENT

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Preserving and improving the health of each individual is one of the basic tasks, but also a challenge for the social community. Factors that endanger the state of health are the modern lifestyle, exposure to stress, lack of physical activity, poor living conditions, inadequate eating patterns, and others. The need for preventive activities of the social community itself in order to preserve the health and work potential of the society in general is extremely important in the new age. Motivated by the fact that health marketing is a path of preventive action towards sustainable development, the authors conducted an initial research, the results of which will be partially presented in this paper.

The aim of the research was to determine the effectiveness of health marketing based on the knowledge, attitudes and practices of the respondents, within the framework of promotional activities related to healthy lifestyles.

The results we reached show that a significant number of respondents do not live healthily (consumes tobacco products, does not have proper eating habits, does not engage in physical activity to a satisfactory extent), only 24% of respondents attended lectures or promotions that were related to health education contents, and for the purpose of preventive health activities that further imply sustainable development.

For the purpose of sustainable development, health marketing is a very powerful tool, the tools of which can be used to improve information, but also to raise awareness and ultimately improve the health of the entire population.

Keywords: promotion, health marketing, lifestyle, sustainable development

MARKETING IN SECURITY EDUCATION AND IMPROVEMENT OF ENVIRONMENTAL SECURITY

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Marketing, as an unavoidable modern activity, opens up significant opportunities for the improvement of many activities, including the modern level of general security and various special forms of security. In the current circumstances at the local, regional and world level, the word security is becoming very important in terms of marketing and is increasingly present in both positive and negative aspect. The positive marketing aspect refers primarily to the need for increasing security education and increasing the level of security, as a direction for further action and positive preventive activities towards a safer and more secure environment. The negative marketing aspect refers to the endangering of general security due to military and terrorist acts in different parts of the world, but also the increasingly present endangered environmental security due to the action of various factors on environmental media. In the area of security education, marketing and promotion of security have a very important function, primarily in the area of: (a) academic education of future graduate security managers and master security managers; and (b) general education of the population on how to deal with security-threatening or security-critical situations. For many crisis situations that have occurred in recent years, in Serbia and beyond, the marketing performances and activities of security managers were very significant from two aspects: (a) successful resolution of specific problems in the shortest time and with minimal accompanying consequences; and (b) presenting the necessary way of dealing with vulnerable persons, in order to prevent further security risks and disasters in the existing circumstances. Marketing activity is also important for the improvement of environmental security, with five aspects: (a) introducing legal and natural persons to the consequences of improper behavior and endangering the environment; (b) introducing the legal obligations and penal provisions for their violation; (c) introducing the procedures in case of environmental accidents; (d) introducing the necessary protective measures, which must be taken in specific environmental circumstances; and (e) introducing the activities that should lead to an increase in the level of environmental security. The whole overview of the functional role of marketing in the field of security education and environmental security confirms the need for additional attention to marketing as a component of the work of security managers in modern crisis conditions and particularly sensitive security situations.

Keywords: marketing, security education, environmental security.

ECOSYSTEMS OF SMART SOLUTIONS - APPLICATION AND PERSPECTIVES OF THE PRINCIPLES OF SMART CITIES IN SERBIA

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Our future is determined with nowadays investments to challenges resistant cities which brings rapid, growth tendency urbanization process and future crises. Cities have accumulated problems: overpopulation, environmental pollution, plenty of waste, consumption of energy, impassable traffic and crime acts, considering actual condition in saran cities that would with usage of smart technologies – contemporary and progressive systems to response to future urban crises: urban mobility, environment protection, energy efficiency, smart management etc. Current partial implementation of smart solutions in distinction of smart communities, transcendence of gap among problems and smart technology solutions requires smart management and networking by ICT and IoT technologies for data usage and effective decisions, which makes city smart and ensures comfortable future of living simultaneously involves citizens to active smart communities and improves reliance. Municipality of Bela Palanka has good practice of smart approach in area of smart mobility and public safety with functional and smart video survelliance, autonomous decentralized system of heat in Trstenik, biomass heating system (plants) in Mionica, Priboj and Mali Zvornik. These environment management concepts are numerous, but yet is not achieved overcoming of partial solutions to smart city system.

Keywords: Smart cities, urbanization, urban crises, ICT, IoT, examples of good practice.

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Section 2

RENEWABLE ENERGY SOURCES AND ENERGY TRANSITION

Sekcija 2

OBNOVLJIVI IZVORI ENERGIJE I ENERGETSKA TRANZICIJA

HYDROGEN IN ENERGY TRANSITION

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The global urgency to deliver clean energy alternatives and decarbonize is growing. Climate changes that humanity is facing, and to which it has only contributed, are the driving force of the energy transition. As part of climate change mitigation efforts, the transition to low-carbon energy systems requires essential and fundamental "shifts" in energy production and consumption.

Achieving this goal is not at all easy and simple and requires a comprehensive/ integrated approach to the individual problems of which it is composed. The energy transition is a huge civilizational transformation and requires strategies, time, resources, a change of mindset and new habits. The transition from coal to wind is only easy to show on the paper, while in practice the process is very demanding.

Great resistance to changes, as well as uncertainty among people causes fear of possible job loss and disbelief that changes bring with them new opportunities and new jobs.

That is why the first step in the implementation of the new energy order is comprehensive education on energy efficiency, economic sustainability and environmental suitability of new energy sources.

The energy transition implies a gradual transition to renewable energy sources, and as their collaborator, the energy vector-hydrogen is included. The hydrogen concept is actually a way to obtain the cleanest and most advanced medium, which is green hydrogen. Green hydrogen should become the highest goal of the energy transition because it meets all the conditions of net-zero emissions.

The implementation of green hydrogen faces major technical challenges that need to satisfy the value chain, starting with economic, energy and environmental parameters. Each step in obtaining green hydrogen and its storage and use is subject to improvement and represents a challenge and determines the speed of the energy transition.

As a group of scientists dealing with the electrolytic production of hydrogen, the focus of our research is the improvement of this process, which is one of the keys to the energy transition. In our work, the results related to new materials whose catalytic properties positively influence the hydrogen evolution reaction (HER) are presented.

Keywords: transition, green hydrogen, electrolysis, new materials.

DEVELOPMENT OF A NEW TECHNOLOGY FOR OBTAINING FERRIC-PHOSPHATE FOR APPLICATION IN THE PRODUCTION OF LITHIUM BATTERIES

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A lithium-iron-phosphate battery, LiFePO4 battery or LFP battery, is a type of lithium-ion battery in which lithium-iron-phosphate is the cathode material. LiFePO4 has many advantages over other Li-ion battery designs and older lead-acid, LA batteries. These batteries are lighter in weight, safer to use, have better charge and discharge characteristics, and have a much longer lifespan. The paper presents the results of the hydrometallurgical process of obtaining ferric phosphate from the Jarosite waste sediment, previously leached with water. The solid residue was then treated with HCl under defined conditions in order to convert Fe into a soluble form. After precipitation of $Fe(OH)_3$ and separation of the solid from the liquid phase, $Fe(OH)_3$ was dissolved with H_2SO_4 to obtain a ferric sulfate solution. By reacting a ferric sulfate solution with phosphoric acid, and after pH correction with NH_4OH, a ferric phosphate product was obtained whose quality meets the requirements of the standard for obtaining lithium batteries in relation to the content of Fe, P, Mg, Na, K, Cu, Mn, Co and Cr.

Keywords: hydrometallurgy, ferric phosphate, lithium batteries, jarosite

CONSTITUENTS OF PLASTIC PELLETS AND THEIR POSITION IN WASTE MANAGEMENT FROM THE TECHNOLOGICAL, ECONOMIC AND ENVIRONMENTAL SAFETY ASPECTS

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Although, according to the principle of the waste management hierarchy, recycling is only in the third place in the order of priorities, it is often presented to the public, unjustifiably, as a key solution that will contribute to the reduction of environmental pollution. However, almost all plastic, which represents a significant share of municipal solid waste, contains various toxic substances that, without elimination, find their way into the next production cycle. The suggestion is, justifiably, that plastics containing such contaminants should be labeled as non-recyclable materials. However, the question arises whether these are all contaminants or, in fact, at this level of production technology, constituents. This paper shows that toxic substances are present in plastic pellets for two reasons. The first is the production process of polymers and the raw materials used, and the second is an inadequate recycling process. Although it would have a relatively negative economic impact, this paper goes one step further and proposes to limit, if not ban, the production and circulation of certain polymers.

Keywords: Bisphenol A, brominated flame retardants, Benzotriazole UV stabilizer, polychlorinated biphenyls, polycarbonates, recycling.

IMPROVMENT OF ENERGY EFFICIENCY IN SERBIA AND PROTECTION OF ENVIRONMENT – LEGAL FRAMEWORK

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Climate changes, environment pollution and energy crisis are strong incentives for seeking new paths that lead towards solving problems in energy field. This encompasses modernizing and reviving present energy capacities, keeping update energy technologies and finding new energy sources. That is why stable and reliable energy supply as well as transition to sustainable system, in which environment acceptable technologies will be applied, are vital element of energy sector of every country, especially concerning economic and industrial development.
Improvement of energy efficiency and environment protection, as two complementary processes, is an object of interest and legal regulation not only at an international level, but as well as concerning national legal system. Having that in focus, Republic of Serbia is signatory to many international agreements in these fields and has law-abided itself to accept elementary energy legislation of European Union.

Keywords: environment, energy, energy efficiency, energy sector, legal framework, energy legislation

THE ROLE AND IMPORTANCE OF LOCAL INCENTIVE MEASURES IN THE DEVELOPMENT OF ELECTROMOBILITY

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Transport, especially road transport is one of the main sources of emissions of greenhouse gasses as well as numerous air pollutants that have harmful effects on human health, particularly in urban areas. The technological transition from vehicles using internal combustion engines to more energy-efficient and environmentally friendly vehicles, such as electric ones, is a way to reduce these emissions and their negative effects. In Europe, especially in developed countries, there are numerous incentive measures that speed up this transition. Identifying these incentives as well as the key obstacles on the way to electrification, are the subject of the analysis of this paper. Special attention is paid to local incentive measures that certain European countries use within their vehicle electrification policies and their effects.

Keywords: electric vehicles, incentives, local measures, air pollution

RENEWABLE ENERGY SOURCES: POTENTIALS AND TRENDS IN THE COUNTRIES OF THE EUROPEAN UNION AND THE WESTERN BALKANS

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Switching to renewable energy sources today is not our choice, but inevitable if we want to avoid an ecological catastrophe. The key problem of the future is the problem of energy production. The European Union has set a long-term goal of achieving an 80% share of renewable energy sources in electricity production, which should be realized by 2050. The use of renewable energy sources in the Republic of Serbia is still below the set goals. The lack of results is not due to a lack of potential, natural and financial, but the existence of a large number of different barriers - from political and economic to social - that stand in the way of building most renewable energy projects. In favor of preserving the environment, the Republic of Serbia, by ratifying the Agreement on the Establishment of the Energy Community of the Republic of Serbia, undertook obligations to promote electricity produced from renewable energy sources and to promote biofuels or other fuels produced from renewable sources for transport. The aim of this paper is to point out the importance of renewable energy sources, the existence of obstacles to their greater use and the challenges facing strategic decision makers. The paper suggests basic directions and guidelines for improving the policy of renewable energy sources that would lead to their use on a wider scale, and as an example of good practice, the results of the work of Strauss Adriatic d.o.o. from the Republic of Serbia, which was the first in the region to start applying a unique heating system to coffee husk briquettes.

Keywords: renewable energy sources, European Union, Western Balkans, sustainable development, coffee husk

BIOGAS TECHNOLOGY IN THE FUNCTION OF ENERGY PRODUCTION

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The need to reduce the use of fossil fuels, due to the harmful impact on the environment and the growing energy demand, have led to the production of energy from renewable sources. Access to clean and renewable energy has become imperative for social progress. Improving existing biomass resources into efficient energy carriers such as biogas from anaerobic digestion has the potential to provide clean and reliable energy, with environmental protection, rationally using natural resources and generation of new jobs. Along with reducing greenhouse gas emissions, biogas improves energy security and, as a renewable energy source, enables the exploitation of waste streams. Biogas produced in an anaerobic digestion system is usually burned in a cogeneration unit to produce heat, electricity, and cooling energy. Finally, biogas can be purified into biomethane, used as a fuel for vehicles, or injected into national natural gas networks. Digestate as a by-product of anaerobic digestion is a reliable material for use as a fertilizer in agriculture. This paper summarizes the use of biogas for the production of heat, electricity, cooling energy, as well as fuel with an overview of existing technologies for its use. Also, this paper provides an opportunity to consider the role of biogas in future energy systems.

Keywords: biogas, renewable sources, waste, anaerobic digestion, cogeneration, energy production, biomethane, energy security, environmental protection

OUTLOOK OF THE USE OF WIND ENERGY IN SERBIA

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With the accelerated development of civilization, the fast development of technology and industry, following the entrance into the 21st century, large goals related to sustainable development and the further advancement of civilization are set, whereas the emphasis is on the reduction or the complete replacement of the exploitation of non-renewable energy sources with the use of alternative energy sources. This replacement achieves not only an unlimited amount of energy, but also reduces the negative impact on the environment which is being increased through the exploitation of current energy sources on a daily basis, the result of which can have catastrophic consequences on a global scale.

In Serbia, the use of any kind of renewable energy sources is minimal or non-existent despite a good potential for development in this direction. The construction of facilities for the use of renewable energy is expensive, but progress would be reflected on the economy as well, especially in the long term.

The territory of Serbia is quite specific due to its geographical area because it encompasses the mountainous area of central Serbia, the plains of Vojvodina and has many rivers. This geographic location possesses the potential for the use of wind power. The most significant winds in Serbia are košava, severac (a type of north wind), moravac, the south wind and the southwest wind. The most important winds in Vojvodina are košava, the east wind, the northwest wind, the west and the north wind. The potential of wind power is large because of košava and severac which are two important factors that shape the climate of these parts. Košava is a south-eastern wind which blows from the Carpathian Mountains, and in Serbia reaches the cities of Niš in the south, Subotica in the north and Šid in the west. According to the data recorded so far, the gusts of this wind are the strongest at the entrance to the Djerdap gorge. It brings with it dry and cold weather and greatly influences the western climate. On the territory of Serbia, a wind known as severac is also present. It is a cold wind that reaches Serbia from Hungary in the north and blows across the Pannonian basin and Vojvodina.

Wind generators (wind farms) are a type of power plants that use wind energy. Wind generators are comprised of a pillar-shaped supporting construction, a wind turbine, an electrical energy generator, a part that regulates the generator spinning speed and the wind generator output voltage and the connection to an energy storage system or to the electrical network.

Serbia has technically useable wind potential of a range between 8 and 15 GW. In Serbia, there are potentially convenient locations for the construction of wind generators. These are the eastern parts of Serbia – Stara Planina (the Balkan Mountains), Vlasina, Ozren, Rtanj, Deli Jovan, Crni Vrh, etc. In these regions, there are locations whose average wind speed is over 6m/s. This area covers around 2000 km^2 and in future, around 2000 MW of installed wind generator power can be constructed here. Zlatibor, Žabljak, Bjelasica, Kopaonik, Divčibare are mountainous areas where measurements might determine the suitable locations for the construction of wind generators. The Pannonian basin north of the Danube is also rich in wind. This area covers around 2000 km^2 and is suitable for the construction of wind generators because the road infrastructure is solid, an electric network exists, large centres of electricity consumption are nearby and similar.
Serbia has a total of ten wind farms which are connected to the electricity generation system ("Kula", "Devreč I", "La Pičolina", "Malibunar", "Alibunar", "Kitka", "Kovačica", "Košava I", "Čibuk I", "Plandište I"). The first park was constructed on the Pešter plateau, in the municipality of Tutin in 2011. The largest wind farm "Čibuk I" is located in the village of Mramorak near the town of Kovin, and its capacity is 158 MW. The total power of all the wind farms in Serbia is 430 MW.
The legislation in Serbia is currently being developed in a more positive direction. In the past couple of decades, key laws and draft laws which define and develop sustainable development, environmental protection, as well as the creation of a better and "greener" Serbia. All this goes in favour of using renewable energy sources, among them wind energy.

Keywords: renewable energy sources, wind energy, kosava, severac, wind generators

ECOLOGICAL FRAGMENTATION OF BIOFUELS AND HEALTH ASPECTS OF MANAGING BIOFUELS PRODUCTION

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In the near future, humanity will have to find more environmentally friendly energy sources to cover its energy needs. Currently, renewable energy sources are offered as an environmentally friendly solution, but it is still not realistic to expect that these energy sources will be developed enough to satisfy the growing energy needs of humanity to a greater extent. Bioenergy, or more precisely, biofuels, are being introduced as a replacement for classic fossil fuels, but these fuels also emit gases into the atmosphere, so they are not completely environmentally acceptable. The raw material used in the production of biofuels is very heterogeneous in terms of moisture content and chemical and physical characteristics. Its properties and use determine safe ways of handling and transportation to minimize the health aspect of solid biofuel production.

Keywords: energy, biofuel, ecology, health

FORESTRY AND USE OF RENEWABLE ENERGY SOURCES ON THE EXAMPLE OF SE "SRBIJAŠUME"

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The aim of this paper is to analyze the natural resources managed by the State Enterprise for Forest Management "Srbijašume", from the aspect of using wood as a renewable energy source and using forests as a resource that has its restrictive limits and capacities. Forest ecosystem management is a complex and responsible task and must be viewed under a multidisciplinary approach, not only from the aspect of using wood as a raw material for the wood industry, including renewable energy production. Sustainable management of forest resources is the primary task of the forestry profession, with a constant increase in the total standing wood volume and forest area in the Republic of Serbia. The forest is a renewable resource only under the condition that it is managed in a permanently sustainable and responsible way, which means that the existing growing stock is being improved in all aspects. Otherwise, devastation and reduction of forest areas and forest quality are likely to occur, which would negatively affect the whole society and ecosystems as a whole. The aforementioned gains importance if we keep in mind that science recognizes over 400 functions of general benefit that the society as a whole is given by forest ecosystems.

Keywords: forest, forestry, sustainable management, natural resources, renewable energy

ON THE GREEN PATH OF INNOVATION – HYDROGEN FROM LASER-ASSISTED ALKALINE ELECTROLYSIS

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The dominant problem that needs to be solved today is the issue of energy sources and how to use them, which must be ecological and sustainable - in a word, green. As the best candidate for a global solution to this problem, hydrogen produced electrolytically stood out as a green fuel with no carbon footprint. However, for a hydrogen-based economy to have a realistic and sustainable perspective in the future, it largely depends on its efficient and economically viable production that would meet the market's needs. Special attention in this paper is devoted to the influence of laser radiation on the possibility of improving the process of alkaline electrolysis for obtaining hydrogen, as well as on increasing the amount of separated hydrogen when the electrolytic cell is directly irradiated with a laser beam during the electrolysis process itself. After the experiments, it was determined that the application of direct irradiation of the electrolyte with a green laser at 532 nm wavelength significantly increases the amount of hydrogen produced and reduces the voltage of the electrolytic process, which is directly related to the increase in the energy efficiency of the overall hydrogen production process.

Keywords: green economy, hydrogen, innovation, alkaline electrolysis, green laser

RENEWABLE ENERGY AND SPORTS COMPETITIONS

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Sport is in a unique position to be part of the solution and to play an important role in educating and raising awareness of environmental sustainability issues, including promoting healthy, sustainable lifestyles. Sports business and activities are a tools to promote ecologically oriented management, primarily bearing in mind: the issue of green public procurement, greenhouse gas emissions, energy efficiency, waste disposal and land and water treatment. Establishing environmental goals through environmental preservation trends in modern sports leads to the sustainability of environmental development. By improving the credibility in terms of environmental protection, many sports events through planning and organization create a base for economic and social support on a global level, all with the aim of more rational use of natural resources. Major sports events include participants, spectators, promoters, organizers, sports federations (Local, international), local community, all of whom should have a common goal in the different stages of planning, organization or during the maintenance of sports events, in a way that ensures that they fulfil the inter-generational responsibility for the preservation of the environment in both urban and rural areas. This particularly applies to the Olympic Games, World and European Championships and other events with large numbers of participants or spectators, but the principle can be applied to less elite and mass sporting events. Major sporting events can bring the concept of sustainability into the everyday lives of millions of fans and athletes. The subject of this work is related to renewable energy and sports competitions. The goal of the work is to determine the importance of applying renewable energy when organizing and maintenance sports competitions for the purpose of environmental sustainability. The results of the paper indicate that renewable energy has found its application in a very small number of countries when sports competitions are organized, which requires further hard work by all interested parties on its implementation.

Keywords: environment, sport, renewable energy, competitions

FINANCIAL ANALYSIS OF THE COMPANY FOR THE ELECTRICITY PRODUCTION FROM WIND ENERGY: INVESTMENT APPROACH ON THE EXAMPLE OF THE FINTEL ENERGY STOCK COMPANY

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Wind energy is an efficient renewable energy source that is widely used today to produce electricity in a safe and environmentally friendly way. Its popularity is growing due to the problems of global climate change, rising prices of fossil fuels, increasing environmental pollution, soil degradation, occurrence of acid rain, extinction of plant and animal life and other environmental problems. The aim of this article is to analyse the fundamental business performance indicators, as well as risks and returns on the shares of the company Fintel energija a.d. from Serbia. This company is the most significant independent producer of electricity from wind energy in the domestic energy market. The results of the analysis indicated a gradual decline in the liquidity and solvency of its operations, poor efficiency, as well as the fact that only in 2021 the company made a business profit for the first time, which is not a rare case with newly founded companies. Despite this, institutional investors are recommended to hold shares of this company in their long-term portfolio, while for individual investors, without highly diversified portfolios, its purchase would represent an unfavourable investment decision due to the presence of high non-systemic risk, less market liquidity, as well as less price fluctuations and market overvaluation of this company's shares.

Keywords: financial analysis, investment, wind energy, Belgrade Stock Exchange, company Fintel energy

Section 3

TECHNOGENESIS AND PROBLEMS OF ENVIRONMENTAL PROTECTION

Sekcija 3

TEHNOGENEZA I PROBLEMI ZAŠTITE ŽIVOTNE SREDINE

SOLVING PROBLEM OF CLEAN WATER: INNOVATIVE THEORY OF ECOSYSTEM SELF-PURIFICATION OF WATER AND ITS APPLICATION TOWARD GREEN BIOTECHNOLOGY

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For the sustainable use of the natural resources of the seas, the need to preserve water quality is of great importance. In the publication series of S.A. Ostroumov (articles and books) since 2004, the theory of ecosystem water self-purification has been formulated, in which the main types of functional mechanisms that are involved in maintaining and improving water quality (water self-purification) have been identified and systematized. This theory identifies and distinguishes the following types of functional mechanisms: pumps, filters and mills [1]. In his latest publications, the author of the theory identifies some other, additional types of mechanisms. The theory covers three groups of processes - physical, chemical and biotic ones. Analysis reveals the special role of biotic processes, which have a great influence on both physical and chemical processes [1]. The theory emphasizes the important functional role of all major groups of aquatic organisms that make up aquatic ecosystems. Among them (only some examples are given) [1]: (1) Bacteria - destruction, biotransformation, oxidation of pollutants; (2) Cyanobacteria - destruction, biotransformation, oxidation of pollutants; the release of oxygen into the water; release of dissolved organic matter (DOM); contribution to the formation of detrital particles; (3) Planktonic algae - destruction, biotransformation, oxidation of pollutants; release of oxygen into water, oxygenation of water; release of dissolved organic matter (DOM); contribution to the formation of detrital particles; (4) Zooplankton - water filtration and turbidity reduction; regulation of the abundance of planktonic cyanobacteria and algae; release of pellets and formation of detritus; recycling of nitrogen and phosphorus; (5) Benthic invertebrate filter feeders - water filtration and removal of suspended organic matter (SOM), removal of mineral particles suspended in water and reduction of turbidity; (6) Macrophytes - participation in water oxygenation, contribution to the formation of biogenic detritus; (7) Fish-eating birds nesting on the shores of aquatic ecosystems - removal of fish biomass from water and thereby removal of a part of nutrients from aquatic ecosystems; (8) Other aquatic organisms - contribution to the oxidation of pollutants, contribution to the creation of biogenic detritus, participation in the fragmentation of biomass and mortmass removed from water, contribution to the regulation of the abundance, abundance and functional activity of other above-mentioned groups of hydrobionts.

There are quantitative data in the literature, as well as biogeochemical data on quantitative estimates of the above processes involved in water self-purification. For the development of this theory, the experimental work of the first of the co-authors of these theses (S.A.O.) on the study of the effects of chemical water pollutants on organisms involved in water self-purification was of some importance. Therefore, this theory contains an important section on external (anthropogenic) impacts on the water self-purification system. An important consequence of this theory, which is of great practical and economic importance, is the conclusion that almost all biodiversity of aquatic ecosystems is seriously involved in the mechanisms and processes of water self-purification, as well as in their regulation. This theory provides a contribution to the scientific basis for development of innovative green biotechnology to solve the problem of water pollution, to treat polluted water, to solve the problem of deficit of clean water of good quality.

ENVIRONMENTAL EFFICIENCY OF THE SERBIAN ECONOMY AND ITS DRIVERS

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Pollutant air and water emissions and waste generation without adequate treatment deteriorate the environmental quality. Pollutants enter the environment from the economic system due to production and consumption processes. This paper aims to analyse the environmental efficiency of the Serbian economy and its drivers with prior identification of the dominant pollutants and the activities they originate from. The environmental efficiency measurement is based on the total amount of pollutants emitted into the air due to economic activity (industry excluding households) of the national economy and gross value added in the period 2008-2020.

The emissions of sulfur oxides (34%), carbon monoxide (26%), nitrogen oxides (14%), and non-methane volatile organic compounds (11%) recorded a dominant share (over 84%) in the total air emissions in the analysed period at an average level. The pollutant emissions into the air predominantly come from households (41.7% on average in 2008-2020) and economic activity of Electricity, Gas, Steam, and Air Conditioning Supply (37.2%). Other economic activities contribute up to 4% of total emissions (Agricultural Production, Hunting, and Related Service Activities). The analysis of the relationship between total emissions and gross added value for all economic activities at the national level, households excluded, shows a trend of decreasing eco-efficiency indicators in most periods. This trend indicates an improvement in the eco-efficiency of the economic sectors of Serbia. The eco-efficiency indicator recorded a slight increase in 2015 and 2020, showing a somewhat slight national economy's eco-efficiency compared to the previous year due to a higher emissions growth rate than the increase in gross added value. The amount of polluting substances emitted into the air as a vital determinant of the eco-efficiency indicator decreased and increased alternately in the observed period. An increase in emissions in 2011 and 2019 was followed by the same rate of gross value added growth, which resulted in an unchanged indicator value. An increase in emissions in 2013, 2016, and 2017 was not reflected in the indicator's rise because the gross value-added growth rate is higher than the growth rates of emitted quantities in the same period. The gross added value continuously increased in the observed thirteen-year period and almost doubled in 2020 compared to 2008, which additionally affects the reduction of eco-efficiency indicators.

Keywords: pollutant emissions, gross added value, economic activities, Serbia

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ADSORPTION OF TRACE ELEMENTS BY ORGANOCLAYS BASED ON CATIONIC AND ANIONIC SURFACTANTS

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The synthesis of special organo-mineral materials (organoclays) by intercalation or by grafting organic surfactants to clay minerals has attracted a great deal of attention over the past decades. Organoclays have important practical applications as adsorbents of different pollutants (Perelomov et al., 2021).
The sorption properties with respect to heavy metal cations (using lead as an example) of organo-mineral complexes based on layered silicates (kaolinite and bentonite) and organic substances with the properties of cationic and anionic surfactants have been studied. It is shown that intercalation of cationic surfactants into the structure of bentonite reduces the adsorption of heavy metals due to competition for sorption positions. Organoclays based on anionic surfactants - alkyl sulfates at low metal concentrations adsorb approximately the same amount of the trace element as the pure mineral; at high concentrations, adsorption increases and exceeds the adsorption of the element by bentonite. The adsorption of lead by these organoclays is better approximated by the Freundlich equation than by the Langmuir equation. Obviously, the reason is the formation of new sorption clusters on the surface of phyllosilicate layers with the participation of anionic surfactants and the nonspecific adsorption of lead by them at its high concentrations in solution. Modification of bentonite by salts of fatty acids slightly reduces, and modification with fulvic acids at low concentrations does not change the adsorption of the metal by bentonite-based organoclays. All organic modifiers reduce lead adsorption by kaolinite-based organoclays. Thus, organoclays based on bentonite and anionic surfactants, as well as, under certain conditions, fatty acids and fulvic acids can be used as sorbents for cleaning soils and waters contaminated with heavy metals. They will have the greatest efficiency with the simultaneous presence of organic pollutants, to which organoclays have an increased chemical affinity.

Keywords: clay minerals, heavy metals, surfactants, fatty acids, organoclays, intercalation, adsorption

Acknowledgement: The research was carried out within the framework of the State task on the topic: "Immobilization of trace elemebts by the products of interactions of layered silicates with soil organic matter and microorganisms" (Additional Agreement No. № 073-03-2023-030/2 from 14.02.2023 to Agreement № 073-00030-23-02 from 13.02.23).

ASSESSMENT OF CONTRIBUTIONS OF TECHNOGENIC FACTORS TO THYROID CANCER RISK IN THE URABN POPULATION OF THE BRYANSK REGION (RUSSIA)

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In several publications it has been shown that urban population is more susceptible to thyroid cancer (THYC, ICD-10 code C73) than rural population. In USA in rural communities 14% fewer cases of THYC are detected than in urban areas (McDow et al., 2020). In Canada, 39.2 cases per 100,000 women are detected in Ontario (85% urban population) and only 4.3 in Yukon (60% urban population). Significant differentiation in cancer incidence has also been identified in Russia. In 2021, the crude rate of all cancer cases detected in urban areas was 13.6% higher than in rural settlements (Kaprin et al., 2022). Similar pattern was found earlier in the Bryansk region (Korobova et al., 2020). According to the data of the Bryansk Clinical and Diagnostic Center, the "crude" incidence of THYC was 19.7 per 100,000 people per year in cities over the period 1986-2020; 19.0 in towns; 16.6 in rural settlements.

The aim of this study was to compare the estimated contribution of radioactive and other air pollution in the district centers of the Bryansk Region (Russia) to the incidence of THYC using GIS-analysis of geochemical and medical data.

To assess urban contamination with iodine radionuclides, estimates of ^{131}I deposition in populated areas have been used (Pitkevich et al., 1993); these estimates have been obtained by recalculating measurements of ^{137}Cs (according to Zvonova, 2009). Atmospheric air pollution by other anthropogenic emissions was assessed according to the Database of Municipal Data for 2008-2018 (gks.ru/dbscripts/munst/). To assess the contribution of individual components (particulate substances, SO_2, CO, NO_x, carbons, volatile organic compounds, other substances), data for the period 2014-2017 was used. Normalized incidence of THYC in the population over the same period was compared with data on anthropogenic pollution. In the 28 district centers under study, 5123 cases of THYC were recorded from 1986 to 2020. For the analysis they were divided into groups according to the age of the patient at the time of the Chernobyl accident. There was a direct (R=0.401) significant (p=0.03) correlation between the incidence of THYC among exposed people and ^{131}I contamination. For those who were born after 1986, the significance of correlation was not found (p=0.58), but for this group a correlation between incidence of THYC with air pollution by particulate substances (R=0.519; p=0.01), which is more pronounced than in the first group and not manifested in other groups, was detected. Thus, technogenic factors contributing to the occurrence of THYC in the study area apparently include not only radioactive contamination by isotopes, but also atmospheric air pollution mainly by vehicles and industry.

Keywords: urban population, oncology, Bryansk region, technogenic contamination, ^{131}I, thyroid gland

GEOCHEMICAL ECOLOGY OF ANIMALS AND BIOTECHNOLOGY

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Under current conditions of an ever-increasing man-made transformation of nature, the evolution of the chemical elemental composition of living matter, including animals, is taking place. The biogenic migration of chemical elements varies over time. It strives for maximum manifestation within certain limits corresponding to the homeostasis of the biosphere as the main property of its sustainable development. The nowaday state of the biosphere is characterized by a constant increase in entropy. At the same time, the improvement of civilization during the transition of the biosphere to the noosphere is associated with the stage of "adaptation". The latter consists in the approximation of production technologies and the use of materials to such a state of matter migration and energy transformation that fits into relatively natural biogeochemical cycles. Under these conditions, the problem of the evolution of chemical elemental composition is a central problem in geochemical ecology and biogeochemistry. There is a lot data on the huge role of geochemical factors in the life of organisms, including animals. The geochemical role of animals in the migration of chemical elements in the biosphere is extremely important for maintaining the state of organization and relative homeostasis of biosphere taxons. First of all, as heterotrophic organisms, animals process a huge mass of plants and living matter in general. If soil animals contribute to the processing of detritus and the formation of soil as an ecosystem and biogeochemical environment, then terrestrial herbivores pass tons of plant feed through their bodies, releasing huge masses of chemical elements in the form of excrement into the environment. Animals in the process of vital activity carry out invasion of plants, and their burrowing and motor activity is reflected in the appearance of the habitat. In this case, the environment-forming and environment-supporting functions of animals in nature are clearly manifested. The chemical composition of animal organs and tissues is used to assess the ecological condition of territories and determine the status of trace elements. Theoretically, the identification of biogeochemical anomalies is based on the ecological and biogeochemical principle: all changes occurring in the biosphere are reflected in changes in the properties and composition of living matter. This shows another property of living matter – information capacity. Currently, the indication of microelementhoses of animals and man is developing according to the chemical elemental composition of organs and tissues, for example, according to the elemental composition of the hair cover. Thus, animals are one of the links in the biogeochemical food chain that ensures perpetual movement – the biogenic migration of chemical elements and their compounds in biogeochemical cycles. On the other hand, animals are a natural companion of man. In addition to practical significance, animals have an aesthetic influence on humans, contributing to the preservation of the spiritual principle.

Keywords: geochemical ecology, animals, biotechnologies, trace elements

The work was carried out according to the State assignment of GEOHI RAS

NEW EXPERIMENTAL DATA ON CHEMICO-BIOTIC INTERACTIONS EXEMPLIFIED BY BIOSORPTION OF LEAD (PB) BY PHYTOGENIC MATERIAL: TOWARD DEVELOPING INNOVATIVE BIOTECHNOLOGY

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The study of sorption of toxic substances, including heavy metals, with organisms and biogenic materials is of considerable interest from various points of view, including the search for answers to topical issues of biochemical ecology and biogeochemistry, migration of chemical elements (heavy metals) in the biosphere, to develop innovative technologies and biotechnologies for cleaning the environment from chemical pollution. In this work, the possibility of binding (sorption, biosorption) of lead (Pb) with biogenic material (SG22) of plant origin was tested. Our experimental results demonstrated that 30.9% of lead was bound and removed from water. The new data on biosorption and sorption of toxic metals (exemplified by lead, Pb) are applicable to develop innovative green biotechnology. The new data are in accord with our previous studies of sorption and biosorption.

Keywords: green biotechnology, chemical pollution, heavy metals, lead, sorption, biosorption, biogenic material, phytogenic material, water purification, environmental conservation

THE CONTENT AND BALANCE OF TRACE ELEMENTS IN THE HAIR OF YOUNG CHILDREN OF THE WESTERN REGION OF BELARUS

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The expansion of the spectrum of studies of the trace element status of the population, using inductively coupled plasma mass spectrometry (MS-ISP), opens up new opportunities for optimizing nutrition in a problem group of children aged 1-4 years, due to the transition to a mixed diet and exposure to the adverse environmental factors and dietary intake. The number of such studies is small and does not rely on reliable reference values when using non-invasive obtaining of objects of analysis.

A study of the hair of 60 healthy children aged 1 to 4 years (on average 3.31±1.69 years) living in Grodno, was carried out using the MS-ISP method. After nitric acid treatment, the samples were analyzed on the Elan 9000 mass spectrometer, "Perkin Elmer", USA, and the median value was determined in the entire data set, serving as a conditional reference value for each microelement studied. Significant deviations from the median value were detected in 49% of the examined children (deficiency of essential elements in the hair on average – in 23.6% of the examined children, excess content of toxic elements in 24.4% of children). Reduced levels of Se (in 81.8% of children), Zn (38.2%), Co (32.1%), Fe (14%), Cr (13.4%), Mg (75.6%) were accompanied by increased levels of Ca (59.3%), Mn (30.7%), Cu (23.8%). Elevated levels of Pb, Cd, Ni (in 68% of children), as well as subtoxic concentrations of Al (in 5.7% of children) were revealed. An imbalance in the ratio of chemical elements (in particular, Ca/P, Fe/Cu, Zn/Mo) has been established, which is an aggravating factor in the microelement status.

The estimated multiple regression of the analysis data in the hair, depending on the age of the examined children, indicates the probability of achieving compensation for the status of trace elements at the age of 3.41 years. Analysis of the distribution of predicted values of the medians of bioelements depending on the age of children showed that at the age of 3.2-3.4 years, the number of deviations in the trace element composition of the hair is leveled: a possible imbalance is compensated in 65% of children ($p < 0.05$) and persists until 3.6-4 years.

It seems necessary to study hair in certain representative groups of children (from 1 to 4 years old) in order to substantiate nutrition recipes aimed at optimizing the microelement status.

Keywords: mass spectrometry of hair trace elements, children aged 1-4 years, deficiency and imbalance of essential elements, toxic trace elements.

LEGAL ASPECTS OF LIGHT POLLUTION

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As a consequence of suburbanization and technological progress light pollution represents an increasingly significant environmental problem, which has numerous negative impacts both on human health and the wild life, together with a huge energy consumption. Nevertheless, these facts are still not sufficiently recognized in global environmental and climate change studies, as well as in sustainable development policies. Today, only a dozen countries in the world have special laws on protection of light pollution. Moreover, in European Union there are still no obligatory rules related to the limit values of light emissions with the aim to protect the environment from their harmful effects.

Although Serbia has made some efforts to install energy-saving public lighting through public-private partnerships, there has not been taken any initial steps in terms of adoption of legal regulation according the light pollution jet. Therefore, it is necessary to prepare a comprehensive study that represents all harmful impacts of light pollution as a key basis for adoption special law on these problems. At the same time, we should also take the advantages of private law actions against light immissions, taking into account that nowadays the protection of private property rights and individual interests also provides protection to the environment.

Keywords: light pollution, light immissions, light pollution regulation, environmental protection

A WEB SOFTWARE SOLUTION IN SUPPORT OF AN ALLERGEN-FREE ENVIRONMENT

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The European Territorial Cooperation Program supports cross-border, transnational and interregional cooperation programs with the aim of economic and social empowerment of regions inside and outside the European Union, promoting the values and goals of sustainable development. Cross-border areas, the municipalities of Sombor and Baja, are threatened by a high concentration of allergens, stimulated by allergenic plants, primarily ragweed. The IPA (Interreg ipa cbc - Hungary-Serbia (IPA Projects) - http://www.interreg-ipa-husrb.com/) cross-border program Hungary-Serbia is an initiative funded by the European Union, within which the project "Support to an Allergen-Free Environment (SAFE), selected among eight best practice projects, was implemented.
The goal of the project was to improve environmental conditions in cross-border regions (AP Vojvodina and Bačka-Kishkun District) by preventing the spread of allergenic plants. The Project activities have led to a significant reduction in air pollution and raising the level of awareness of the population. New personal and professional contacts of competent authorities and the population were established in the creation of an institutional network. Mechanical and chemical treatments of ragweed, measurement of pollen concentration in the air, data collection, awareness raising, and education of target groups were carried out. A new database and web software solution were created to support the implementation of the project, which ensured the control of project activities. The paper highlights the role and influence of Internet technologies in the implementation of the SAFE project. Everything resulted in a significantly better quality of life, creating an environment without allergens in the cross-border area.

Key word: EU project, support for allergen-free environment, database, web software solution, population awareness raising, allergen-free environment, sustainable development

ASSESSMENT OF THE CONCENTRATION OF THIOCONTAINING SUBSTANCES IN PLANTS DURING ENVIRONMENTAL STUDIES

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Various bioindication methods based on intrapopulation, morphological and biochemical changes are used to assess the ecological situation of natural and man-made landscapes. When polluting territories with metals under the influence of the mining industry, we evaluate the synthesis of SH compounds in plants. by means of HPLC-NAM spectrofluorimetry. In order to assess the effect of metals on the level of phytochelatins in plants in 2021 year, the leaves of white willow *Salix alba* L. and other woody and vascular plants were selected throughout the river Ardon (North Ossetia), where in the central part of the riverbed was located the Unalsky tailing dump of the pulp of the Mizursky GOK (pulp with a high content of Pb, Z, Cd and Cu). Plant leaves were homogenized in the cold with mixture of methanol and 0.1 M phosphate buffers (pH=6.8) and, after centrifugation, sulfur–containing compounds, phytochelatins, oxidized glutathione, reduced glutathione (Gl), metallothioneins (MT), dl-cysteine and glutathione derivatives were determined. A total of 14 leaf samples were selected and analyzed. The high-performance liquid chromatography was used to separate various biologically active sulfur compounds (HPLC) with preliminary derivatization of substances by means of N-9 (acridinyl) maleimide (NAM) or o-phthalic dialdehyde. Chromatography of substances was carried out on BioSep type columns. It was found that for the separation of Gl and MT in the form of NAM derivatives, the use of exclusive HPLC on BioSep type columns is most acceptable: (00H-2146-E0, Phenomenex) 300x4.6 mm. It has been established that the synthesis of phytochelatins is differentiated when territories are polluted with metals under the influence of the mining industry. Oxidized glutathione prevailed in the leaves of the white willow - *Salix alba* L. and spurge -*Euphorbia virgata* Waldst et Kit. A positive correlation was found between the content of metals in soils and plants and a moderate correlation between the amount of phytochelatins and metals in willow and milkweed leaves. A positive correlation was established between the content of metals in soils and plants (r= +0.86), as well as a certain relationship between the concentrations of metals in soils and willow leaves and the total content of phytochelatins (r = +0.63-0.65). Thus, the application of a new method for the quantitative determination of nanogram amounts of SH-containing compounds (cysteine, methionine, Gl, MT and their derivatives) by HPLC-NAM spectrofluorimetry in plant leaves made it possible to identify additional adaptive biochemical reactions of plants under conditions of relatively background and metal-contaminated landscapes.

Keywords: plants, soils, metals, SH compounds, glutathione, willow, milkweed

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RADIOACTIVITY IN MOSSES AND SOILS COLECTED 2018 AND 2019 IN REGION DOBRA, NP ĐERDAP

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Samples of mosses (13) and soils (13) were collected in June 2018 and 2019 on the territory of National Park (NP) Đerdap from the region Dobra. The radionuclide content (Bq/kg) in soil (moss) ^{137}Cs 7.74-452 (5.5-128), ^{40}K 256-612 (159-470), ^{226}Ra 12.9-38.5 (4.2-40.1), ^{232}Th 2.1-35.7 (3.0-27.2). Transfer factor (TF) value: ^{137}Cs 0.09-2.25, ^{40}K 0.33-1.25, ^{226}Ra 0.16-2.84, ^{232}Th 0.14-2.43. Calculeited average value of TF increase in foloving order ^{40}K<^{232}Th <^{226}Ra<^{137}Cs.

Keywords: Mosses, Soils, Radionuclides, Transfer factor

METAL TOLERANT BACTERIA OF SEWAGE SLUDGE FROM WASTEWATER TREATMENT PLANTS

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In the context of urban population growth and an increase in the volume of wastewater, the problem of developing effective technologies for processing sewage sludge into safe products for their use, including in agriculture, is relevant. In this regard, strains of microorganisms that are part of sewage sludge, capable of destroying organic matter and at the same time resistant to high concentrations of heavy metals, are of great interest.

Bacterial strains resistant to six heavy metals: Co, Ni, Cu, Zn, Cd, and Pb in the concentration range of 3–5 mmol were isolated from sewage sludge of different ages (1 day – 5 years) from sewage treatment facilities in the city of Tula. Strains with medium (3 mM) and high (5 mM) resistance to the studied elements were selected by phenotype and cultivated. Some bacteria were resistant to two and three heavy metals simultaneously. The content of heavy metals in sewage sludge was high, and for a significant part of the elements, the maximum concentrations were observed in five-year-old sludge. The metal tolerance of isolated strains of bacteria in a significant number of cases correlated with the maximum content of heavy metals in their habitat.

As a result of Sanger sequencing, 12 metal-tolerant strains of Gram-negative and Gram-positive bacteria belonging to the genera *Pseudomonas, Serratia, Klebsiella, Rhodococcus, Stenotrophomonas,* and *Citrobacter* were identified. The ecological and physiological features of the isolated strains were studied. The range of optimal growth temperatures for most strains was 15–30°C, although some strains grew at 7°C. All isolated strains grew in the pH range of 5–9. Satisfactory growth of two strains was noted in an acidic medium with pH 4. Most of the strains grew at the NaCl concentration range of 1–5%.

After the identification of metal-tolerant strains isolated from various wastewater treatment facilities, using heuristic search algorithms and special software, their phylogenetic trees were built.

Keywords: microorganisms, heavy metals, wastewater treatment plant, Sanger sequencing

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CURRENT NEWS OF COAL MINERAL ECONOMY, BUSINESS DECISION-MAKING AND CONNECTION WITH THE GREEN ECONOMY

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The mineral sector and the mineral economy of Serbia are in specific crisis conditions, which are additionally burdened by the consequences of Russian-Ukrainian military operations, the current economic and energy crisis. Considering the current state of energy and energy supply crisis, including the impact of the EU embargo on the import of Russian oil and gas, the mineral economy of coal, as a source of electricity in Serbia and the Balkans, has a particularly interesting position. The initiated energy transition to green energy facilitated the development of a green economy, in order to reduce the consumption of fossil fuels, reduce carbon emissions and increase the use of renewable energy sources. Nevertheless, the crisis conditions of electricity supply in some countries, in addition to the clear definition of the mineral policy to significantly reduce the consumption of fossil fuels, led to a change in previous strategic and business decisions regarding the status of coal as an energy mineral raw material. Certain European countries have made decisions on the reactivation of previously closed coal mines, in order to provide sufficient quantities of this energy source for the needs of the economy and the population. In this way, the so-called black and illegal energy, with a tendency to be completely removed from production, at least for a limited time became economically interesting, energetically acceptable, despite certain environmental impacts. The mineral economy of Serbia found itself in a special problem, because coal production was reduced at the end of 2021 due to the insufficient level of technical capacity maintenance. Because of this, Serbia was forced to turn to the import of the necessary quantities of coal from the countries of the region, which meant extraordinary costs, the problem of additional financial resources and further borrowing by the country in a very unfavorable economic situation. Decisions made on undertaking the necessary activities in the mineral sector in Serbia to restore coal production to the previous level for strategic, economic and energy reasons cannot provide immediate results, but are aimed at medium-term realization. Although they are not in favor of the green economy and the energy transition to green energy, these decisions have multiple positive effects on energy security and safety, which are important for overcoming the crisis period and for further economic and social development of the country.

Keywords: mineral economy, coal, business decision making, green economy

FOOD PLANT DIVERSITY IN CULTURAL ECOSYSTEM SERVICES PERSPECTIVE: COULD THEY BE DRIVERS OF GASTRO-TOURISM OFFER IMPROVEMENTS

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Recent studies indicate a decennial decline in wild edible plant resources consumption and use in traditional cuisine, while Covid-19 reversed this situation in the last two years into increased demands for well-rooted traditional products. By using the literary potential of wild edible plants in gastronomy and semi-structured interviews (n-29) in affirmed rural tourist households, research investigate 1) the diversity of wild edible plants proven in gastronomy, 2) the diversity of plants that are currently used in the preparation of traditional dishes and 3) an experimental tourism model was conducted to evaluate the relationship between wild edible plants and tourism-related cultural ecosystem services.The results show limited plant diversity patterns used as traditional food components compared to natural resource potentials. In the range of cultural ecosystem services, results indicate the variety of categories in which wild edible plants represent the catalyst of local eco-gastro tourism improvements through the authentic sense of gastronomy, herbal tours, rare species, etc.

Keywords: wild edible plants, cultural ecosystem services, gastro-tourism

ANALYSIS OF GLIADIN CONTENT IN DEVELOPED DISHES FOR CHILDREN WITH CELIAC DISEASE

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The symptomatology of celiac disease, as a rule, is most evident in childhood and requires the creation of conditions for life-long adherence to a gluten-free (aglutene) diet, it is strictly forbidden to take even small doses of gluten, respectively, even traces of gluten can cause negative health effects. Therefore, it is preferable to use specialized gluten-free foods, the maximum level of gluten in such foods should not exceed 20 mg / kg (usually 20 parts per million (ppm)). Daily intake of up to 10mg of pure gluten or 500g of food containing 20mg/kg of gluten has not been shown to cause any signs or symptoms in most patients.

Modern marketing research shows that the share of gluten-free products in retail has doubled worldwide. However, they remain significantly more expensive than gluten-containing products.

In connection with the foregoing, the development of recipes and technology of dishes for children with celiac disease appears to be especially relevant for preventing violations of gluten-free diets by children. The purpose of this study is to determine the actual content of gliadin in the developed dishes and products for children with celiac disease for use in educational institutions.

During the study, recipes and technology of dishes were developed for 11 dishes, namely, hot dishes: 1 - low-protein noodles with stewed vegetables, 2 - stewed stuffed tomatoes, 3 - buckwheat porridge with vegetables, 4 - vegetable casserole assorted, 5 - chicken meatballs with cheese, 6 - low-protein potato pancakes and 7 - rice balls; new soup: 8 - soup with meatballs and spinach; sweet dishes: 9 - gluten-free rice flour pancakes, 10 - beetroot mousse and 11 - gluten-free apple marshmallows. The main products used in the development of dishes were: apples, potatoes, poultry, tomatoes, rice flour, beetroot, onions, milk, vegetable oil, white cabbage, bell peppers, carrots, rice, buckwheat, sour cream, low-protein noodles, cheese and zucchini. All developed dishes have excellent organoleptic characteristics.

Determination of the actual content of gliadin in food products using the test system "Ridascreen Gliadin" produced by R-Biopharm, Germany (Method of performing measurements MVI.MN 4658-2013). The results of laboratory studies of the developed dishes showed that the content of gliadin in the presented samples is less than 10 mg/kg (10 ppm), which allows them to be used in a gluten-free diet.

The developed dishes will facilitate the preparation of daily diets for children with celiac disease in educational institutions, and make them more individualized. The developed dishes have such advantages as variety (the presence of sweet dishes) and a larger assortment list of ingredients in comparison with existing diets. Offering a wider range of foods is essential to prevent children from breaking the gluten-free diet.

Keywords: gliadin, gluten, gluten-free diet, celiac disease

ECOLOGICAL AND BIOGEOCHEMICAL MONITORING OF ENVIRONMENTAL POLLUTION DURING THE OPERATION OF OIL AND GAS CONDENSATE FIELDS IN THE NORTH OF WESTERN SIBERIA

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The efficiency of biogeochemical methods has been evaluated in the long-term assessment of environmental pollution in the operating conditions of oil and gas condensate fields in the north of Western Siberia. The complex of ecological and biogeochemical studies included a detailed study of terrestrial ecosystems with sampling of soils and plants. The ICP-MS method determined the content of metals (Fe, Sc, Hg, Ni, Mn, Cr, Pb, Zn, Cd, Cu, Ba, Co, Sr,) with complete acid decomposition of the samples. The concentration of chorides, sulfates, phosphates and nitrates was measured by ion chromatography. To assess the level of soil pollution, the method of calculating the technogenicity of metal (normalizing metal Zr) was used. The biogeochemical features of pollution of environmental components from various sources of exposure are determined: drilling sludge, reservoir waters, motor transport, aerotechnogenic transfer. Biogeochemical indicators were identified and their role in fixing weakly abnormal changes in the state of the environment was shown. High concentrations of total nitrogen, chlorides, phosphates, petroleum products and metals with a significant proportion of technogenicity (Tg) Sr, Na, Mn, Fe, Ba, Zn, Ni, Co, Cu were noted in the drilling waste spill. The degree of technogenicity of indicator metals gradually decreases to the level of Tg<20% at a distance of 100-150 m. Reactions of indicator plant species Ledum decumbens and Cladonia stellaris have been established. They react to subtle changes through an increase in ash content and an increase in the intensity of absorption of metals. The parageneses Ba46/(Cd 54 Pb35) and Mn48/Sr59Ni55Ba51 are associated with anthropogenic pollution from spent drilling mud. It is established that the list of metals-indicators of pollution depends on the type of exposure and the type of plants. When analyzing the impact of oil and gas production on environmental components, the change in the concentrations of Na, Ba, Sr, Fe, Mn, Zn, V and Cr is most clearly manifested in them. The effectiveness of the approach was verified using the reactions of Chlorella vulgaris and Daphnia magna test objects.

Keywords: ecological and biogeochemical monitoring, plants, metals, oil and gas condensate fields

THREAT FACTORS AND THEIR INFLUENCE ON THE NATURAL VALUES OF THE ZASAVICA SPECIAL NATURE RESERVE

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The following risk factors were recorded in the reserve: inappropriate water regime, water pollution; eutrophication; habitat fragmentation; habitat destruction and loss; invasive species; agriculture; works in forestry, urbanization; tourism and recreation. The water regime is the most important factor in the survival of the reserve's biodiversity. The lack of inflow and flow of water, the unfavorable water level flooding regime and the pollution of watercourses appear as a threatening factor. An inappropriate regime of water and flooding leads to the impoverishment of biodiversity and the disappearance of rare types of habitats and species. The absence of flooding has unnatural conditions for the development of forest communities and the spread of invasive species. Eutrophication is the process of vegetation succession and is accelerated by human activities in agriculture and forestry. Slow flow and insufficient water contribute to the reduction of water surfaces and the succession of aquatic vegetation into meadow or forest, and thus habitats disappear and meadows are covered with invasive, weedy and bushy species. In the watercourse, the value of the salinity index, the total number and the presence of certain algae indicate clean water with a lower organic load, and localities where there is a stronger human influence have values between II and III water class. The leaching of nutrients from the surrounding fields causes eutrophication and the current level of pollution is relatively low. Due to habitat fragmentation, parts of the reserve are surrounded by agricultural or urban areas where we have the influence of the edge. Cottages next to streams are point sources of pollution and habitats for cats and dogs that hunt in nature. Forest habitats have been cleared and migratory routes have been cut, creating large distances between habitats and subpopulations, which are separated, and the end result is the extinction of isolated populations at the local level. Bridges and culverts with narrow culverts represent a migratory barrier for aquatic organisms because they remain isolated populations. Anthropogenic habitat degradation spreads invasive species. 51 invasive plants were recorded in the Reserve area, 29 taxa have a basic distribution status, 23 taxa have a low progressiveness and 6 taxa have a hyperprogressive status. They are distinguished by their number ruderal species (Ambrosia, Asclepias, Conyza, Amorpha, Ailanthus), which occur on fields, along watercourses, in forests and near settlements. Invasive fish species Carassius gibelio, Pseudorasbora parva, Ictalurus nebulosus and Lepomis gibbosus have a negative impact on the population of indigenous fish and amphibians through competition for food and habitat. The negative impact of agriculture is water pollution with biocides; discarded pesticide and fertilizer packaging; phosphates, heavy metals in water, and their impact depends on the distance of the habitat and the existence of agricultural protection belts, grass belt, groups of trees and bushes, which mitigate the negative impact.

Abandonment of traditional grazing on meadows leads to the growth of bushy vegetation and invasive species. Degradation of vegetation is trampling and excessive grazing where ruderal species occur, but the intensity of trampling and grazing has not yet exceeded the capacity of the pasture. Plantation planting of Euro-American poplars, felling of old trees and equalization of the structure of forest habitats is a factor in endangering habitats and species. Clonal plantations are not suitable for the reproduction, nutrition and rest of specialized species, because the trees are straight, unbranched and have no hollows. Planting clonal poplars in ponds dries out the habitat and accelerates the healing succession. Urbanization leads to the disturbance of fauna by the presence of people, increased traffic, noise, vibrations, light. Roads are a barrier for migratory species and increase the mortality of local populations. Vertebrates have a pronounced native behavior, when they return to the place of hatching, and by disturbing the habitat, the individuals stop reproducing and the survival of the population is threatened. A total of 1,937 individuals of different vertebrates with 86 determined species died on the roads of the reserve and the results show a relatively low mortality rate on the roads. Tourism has a stronger anthropogenic impact on natural habitats. Sources of pollution are fuel tanks for vessels. Birds are negatively affected by vessels whose waves are destructive to nests on floating vegetation. Recreational fishing affects the living world through the organic loading of watercourses with means of feeding and attracting fish, usurpation of the coastal belt and vegetation, construction of piers and piers, movement of boats and disturbance, especially during the holding of competitions with a large number of participants. Disruption of the water regime, processes of eutrophication and habitat fragmentation with the edge effect, with their combined and synergistic action, lead to degradation and complete loss of the habitat and species of that biotope. In Zasavica, the most endangered type of habitat is lowland peat with 0.03% of the Reserve's surface because they are very sensitive and require a constant flow of cold water with anaerobic conditions.

Keywords: risk factors, Zasavica reserve

THE INFLUENCE OF ABIOTIC, ECOLOGICAL AND CLIMATIC FACTORS ON THE DEVELOPMENT OF SEEDLINGS OF WILD PEAR *PYRUS COMMUNIS L*. AND THE IMPORTANCE OF PRESERVING INDIGENOUS PEAR VARIETIES IN THE TOPLIČKI DISTRICT

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Preservation of the genetic resources of fruit trees is of great importance, both because of their natural resistance and because of climate changes, all with the aim of producing healthy food and preserving the environment. In situ conservation of fruit tree biodiversity implies the maintenance and use of natural populations in their natural distribution area. Plant genetic resources are the basis of development, first of all, of organic agriculture. They represent a reservoir of genetic adaptability and are a defense system against diseases caused by pests, negative environmental changes due to climate change, and more. Work on the study of wild species of fruit trees and the raising of collection plantations of domesticated, autochthonous and wild species of fruit trees is, among other things, in the interest of the survival of fruit growing and the preservation of genetic potential. In Serbia, in fruit growing practice, wild fruit species are rarely used as generative rootstocks, especially when it comes to grafting autochthonous varieties of fruit trees. The characteristic of wild and autochthonous varieties is lushness, resistance to major pests, diseases and stressful environmental conditions, such as frost, drought and the like.

Seedlings of wild pear, *Pyrus communis L*., were observed in two localities: in Toplički district, village of Toplička Mala Plana (locality A), Prokuplje and Nišava district, village of Brest, municipality of Merošina (locality B). Although the locations are only 25 km apart, there are differences in edaphic, orographic and climatic conditions, which led to differences in the growth and development of the plants. The monitored parameters in the seedlings are: tree height; girth of the tree at the base; number and length of developed lateral branches. 14 samples were monitored at both locations. The results showed that there is a significant difference in the monitored parameters. The biggest difference was observed in the average height of the trees, namely: on location A - 31.64 cm, and on location B - 16.2 cm. A significant difference was also observed in the circumference of the tree at the bottom: on loc. A - 7.22 cm, while on loc. B - 4.23 cm. Seedlings from locality A also lead in the average number of side branches, which is 7.28, while that number among seedlings from locality B is 4.23. The mentioned differences in parameters can be explained by the difference in abiotic and ecological factors that are represented in these localities.

Almost twice as much progress in the development of wild pear *Pyrus communis L.* seedlings, proves that Toplica is a good region for growing pears. It is also an area that should be used to preserve the genetic potential of this fruit species, as it is extremely adaptable to climate changes, diseases and pests, especially considering the strong root system, which penetrates deep into the ground and provides the tree with sufficient amounts of water in the critical period. The resistance to high lime content in the soil should not be neglected either. By grafting autochthonous varieties on this substrate, we get a lush, long-lived and resistant individual.

Keywords: genetic potential, wild pear, seedling, generative substrate, climate, growth

PLANTS OF DONBASS FOR ENVIRONMENTAL MONITORING

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For many years of industrialization, an unfavorable environmental situation has developed in Donbass (Northern Azov region). This is due to the activities of mining enterprises – primarily coal extraction. The main pollutants are metallurgical and chemical plants. High levels of pollution affect the oppression of the state of all life processes, not only plants and animals, but also humans. In such conditions, industrial botany is an important scientific and applied task. This is a set of measures for detoxification of natural environments, landscaping, reclamation, phytoindication and a detailed assessment of the state of ecosystems.

The flora of the central Donbass counts 2,060 species of vascular plants belonging to 713 genera and 143 families. Today 164 species of flowering plants and 64 species of bryophytes are involved in the phytoindication experiment (using the example of technogenic ecotopes of Donbass). The main phytoindication monitoring program is based on the signs of plant structure. As a rule, these are species with a wide ecological amplitude. Representatives of Asteraceae, Brassicaceae, Fabaceae, Rosaceae, Poaceae, Lamiaceae, Boraginaceae, Plantaginaceae, Pottiaceae, Bryaceae and Brachtheciaceae are characterized by resistance to industrial pollution.

Among the marker characteristics of pollution, detailed signs of the structure of cells, tissues and parts of organs were distinguished. Vegetative and generative organs of plants were analyzed separately. The features of the accumulation of heavy metals and associated pollutants in certain parts of the plant were traced. Groups of hyperaccumulator plants and transformer species were identified for toxic natural environments: air, soil and water. These plants play an important role in pollution reduction processes, but at the same time they are indicators. Among the main information features in the structure of plants we distinguished: trychomes in the leaf structure, the shape and condition of the leaf blade, the architectonics of the stem, the shape of the shoot, the tissues of the embryo, the surface of the seeds, the details of the flower and inflorescence structure. We also studied the dynamics (from 1996 to 2023) of the appearance of abnormalities (ugly forms) of plant structure (in appearance, for seeds, fruits, pollen). Air pollution also worsens in the summer when a large number of pollen grains enter the atmosphere. This affects the health of the local population due to allergies. A special account of new species (quarantine) is being carried out. Such species significantly change plant communities in their standard state, which creates a danger to the sustainability of ecosystems.

Ecological scales and ranges of morphological plasticity of native plant species have been created to assess pollution. Special indexes are plotted on the maps of the area. This allows to track the territories of ecological disaster and risk for living. All the indicators that the botanists of Donetsk National University receive are taken into account in the special State Committee for Environmental Policy in the Donetsk People's Republic. Thanks to the recommendations of scientists, the exchange of experience in landscaping and design of industrial enterprises is carried out.

Keywords: Donbass, industrial pollution, phytoindication, ecological phytomonitoring, landscaping, ecotope assessment.

A SYSTEMATIC APPROACH TO THE SCIENTIFIC REGULATION OF INTERACTION IN THE "SOCIETY-NATURE"

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The necessity of a biogeochemical approach to the analysis of interaction in the “society–nature” system in the conditions of man-made of the biosphere, an important indicator of which is the state of public health, is substantiated. The basic principles and tasks of multilevel medical and environmental monitoring are presented, which allows us to consistently move from a qualitative assessment of the health status of the population and the environmental situation to a quantitative determination of the degree of environmental risk to health and regional hygienic parameters for technogenic factors, taking into account the modification of their effect by biogeochemical environmental conditions. The analysis of the results of testing monitoring at various levels is given: regional (Republic of Crimea), sub-regional (GG Sevastopol, Simferopol), and local (individual cohorts of the urban population). Official data on solving scientific problems at the regional level with a sufficient degree of probability allowed us to identify contrasting territories in terms of environmental risk to health. Sub-regional (within localities) biomonitoring studies in these territories (Sevastopol and Simferopol) found spatial heterogeneity and loci with a higher content of some heavy metals and other chemical elements in media and biosubstrates (soil, plants). Cohort studies of residents of these cities and the determination of the content of 29 chemical elements in the human body and the functional state of target systems in risk groups based on data from correlation and regression analyses allowed us to quantify their physiological significance, as well as the effects of complex influence during background exposure.

Keywords: biogeochemical bases of rationing, medical and environmental monitoring, trace elements, xenobiotics, public health, modeling

THE WAYS OF RESTORING THE SOILS IN MOLDOVA

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Soil is the main natural resource of Moldova. The use of land resources provides 33-40% of the gross product of this country. Therefore, the qualitative state of soils largely determines the sustainable development of the Republic of Moldova. During the Soviet period, successful experiments were carried out in Moldova on the restoration of eroded soils by applying a layer of natural soil materials (meliorants) 30-45 cm thick to the surface of the eroded soil. The restored soils proved to be stable, and the yield of agricultural crops on the restored soils increased by 2 times. A significant part of the soil washed off the slopes is deposited on the bottom of streams and reservoirs. The effectiveness of soil restoration depends on the quality of the raw materials used for reclamation. Therefore, it is necessary to know the amount of chemical elements available to plants, which is contained in the raw material. The analysis carried out by the authors showed that the chemical composition of bottom sediments has been little studied.

The authors summarized the available data on the content of microelements in bottom sediments in the territory of Moldova, as well as conducted additional studies.

Keywords: soil, erosion, Moldova, bottom sediments, reclamation, microelements

MASS CONCENTRATION OF POTASSIUM, THORIUM AND URANIUM IN THE SOIL OF THE REGION DOBRA, NP ĐERDAP, IN PERIOD 2018-2020 YEARS

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Soil samples (39) were collected in June in the period from 2018 to 2020, on the territory of NP Đerdap (from region Dobra, 4 management units). Potassium, thorium and uranium were present in all soil samples. 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 1.20% for potassium, 2.04 mg kg^{-1} for uranium and 5.41 mg kg^{-1} for thorium. The strength of the absorbed gamma radiation dose originating from the activity of radionuclides in the soil and anual effective dose were determined. Values of the strength of the absorbed gamma radiation dose and anual 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, Dobra, soil, mass concentration

APPLICATION OF BIOGEOCHEMICAL METHODS INDICATION OF INDUSTRIAL POLLUTION OF TERRITORIES

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The processes of industrial environmental pollution in the urbanized territories of the Asian part of Kazakhstan and Russia have been comprehensively studied. On the basis of a systematic approach, the methodology of biogeochemical indication of industrial pollution of urbanized territories using elemental and mineral compositions of leaves of woody vegetation has been improved. The dependence of the average content of chemical elements Na, Sc, Cr, Fe, As, Sb, Tb, Lu, Hf, Ta, U, Hg on the growth of population and density in cities has been established. Technogenic geochemical halos and scattering fluxes of F, Cu, Zn, As, Cd, Sb, Hg, U have been identified in the zones of influence of large enterprises of the mining complex, nuclear fuel cycle, aluminum and oil refining industries. A reduced Th/U ratio, as well as 238U/235U, indicates a technogenic source of U intake. The La/Ce ratio>1.0 can be used as a biogeochemical indicator of the impact of oil refining enterprises on environmental components. The mechanism of transformation of acid-forming components of HF and SO2 emissions from aluminum plants with the formation of minerals fluoride (fluorite) and calcium sulfate (gypsum) in the stomata of poplar leaves, as well as the biogeochemical barrier role of calcium in it, is described. The additive geochemical index (Agi) and the coefficient of biogeochemical transformation (Zv) serve as informative biogeochemical indicators that allow for an integrated ecological and geochemical assessment of territories. It is important to take into account the degree of risk to public health, the mechanisms of the impact of natural and anthropogenic factors on the development of chronic non-communicable diseases of the human respiratory system in settlements with the maximum values of integral indicators.

Keywords: biogeochemical indication, cities, trace elements, pollution

ASSESSMENT OF THE CONTENT OF MACRO- AND TRACE EMENTS IN THE CUTS OF MEADOW PLANTS OF THE EUROPEAN PART OF RUSSIA

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In connection with the existing problems of pollution of natural complexes of the Russian Federation with organic and inorganic compounds, there is a need to assess the levels of biologically active chemical elements in various ecosystems. In this regard, a biogeochemical assessment of the conditionally background territories of the Non-Chernozem zone of the European part of the Russian Federation and the Zaonezhye region was carried out according to the level of trace elements, calcium and phosphorus in the mowing of meadow plants. The standard methodology of studying meadow landscapes was used in the work. The determination of chemical elements was carried out by atomic absorption using soil and plant standards.
It has been established that the microelement status of grass mowing in the Northern Territories, Central Non-Chernozem and Chernozem regions are characterized by a "relatively normal state" according to biogeochemical criteria, average world and Western European values, with the exception of copper (4.4±1.8 mg/kg) relative to the "norm" (5-20 mg/kg). Within the Northern Territories – Central Non–Chernozem - Chernozem profile of the European part of the Russian Federation, there is a tendency to increase calcium concentrations from north to south, with the exception of the territories of distribution of podzolic sandy loam soils in the Eastern Meschera. In most of the surveyed territories, the content of trace elements and the Ca/Sr value correspond to the average European values and the biogeochemical criterion of "relatively satisfactory condition". In all mows, the content of vital trace elements (cobalt, chromium, zinc and selenium) corresponded to the biogeochemical criteria of "norm", and the concentrations of toxic chemical elements (cadmium, arsenic, lead) did not exceed hygienic standards and met the biogeochemical criteria of "relatively satisfactory condition".

Keywords: biogeochemical assessment, background territories, plants, macro-nutrients, trace elements

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SYNCHRONICITY OF BIOLOGICAL FORMATION AND GEOLOGICAL PAST IN THE WORKS OF V.I. VERNADSKY

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V.I. Vernadsky formulated in 1921 a fundamental thesis about the eternity of life - living matter is as necessary an element of the cosmos as matter and energy. This is reflected in the book "Biosphere" (1926), which contains the scientist's thoughts about biogenesis, the geological eternity of the biosphere and the constant control of living matter over biogeochemical reactions on the surface of the planet. In subsequent publications, he formulated a scientific concept based on a new understanding of biological time and the geological measurement of the age of rocks. It reflects the events of the geological history of the planet. Currently, the knowledge of the biosphere, as well as other Earth sciences, confirms the conclusions and generalizations by V.I. Vernadsky. Thus, 4.4 billion-year-old minerals were found, formed in conditions of wet and cold Earth. Geological history turned out to be synchronous with biological time. Modern Earth sciences are in dire need of a fundamental basis. Traditionally, geology, geography and other disciplines apply a physical picture of the world based on the Big Bang, astronomical theories about the creation of the Universe, galaxies and star systems. However, these ideas do not create clear patterns of the development of the Earth as a planet and do not explain specific observed events and phenomena. In our opinion, V.I. Vernadsky's concept of the geological eternity of the biosphere can be the fundament, the general theoretical basis of the Earth sciences.

Keywords: V,I. Vernadsky, biosphere, eternity of life

THE IMPORTANCE OF LOCAL BIGEOCHEMICAL CYCLES IN THE EVOLUTION OF MOUNTAIN LANDSCAPES

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Mountain ecosystems, located in the marginal parts of the biosphere, react most quickly compared to the plains to any environmental changes and anthropogenic pressure, which is most often spontaneous. On the other hand, it is in the refugiums of mountain valleys that relict species of plants and animals, relict soils have been preserved. Using the example of Mediterranean-type ecosystems of high-altitude zone, the resistance to climate change and anthropogenic loads of ancient types of the biological cycle of elements is shown. The plant associations displaced by glaciers from the mountain slopes to the loess of the foothills as a "forced" assortment received an excess of calcium and magnesium into the biological cycle. The predominant role of calcium and magnesium has been established for the series of biological accumulation of alpine and subalpine meadows, forest plantations, meadow steppe and juniper forests. Despite the fact that the anthropogenic evolution of plant communities of pasture and hay lands is traced, the orientation of the soil-forming process under them remains stable. The preservation of relict Pleistocene soils (brown, black-brown) on carbonate-free rocks of mountain slopes was possible only with the preservation of the nature of the biological cycle of elements, which acts as the "genetic code" of landscape conservation.

Keywords: mountain ecosystems, biogeochemical cycles, soils, plants

REVIEW AND ANALYSIS OF THE STATE OF AIR POLLUTION IN THE AREA OF KOSOVSKA MITROVICA AND ZVEČANI

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The air of Kosovska Mitrovica and Zvečan contains pollutants in all aggregate states that enter the air from different sources. The analysis of the obtained experimental data revealed that the pollution in the investigated area is mainly of industrial origin (such as lead, nitrogen dioxide, deposited matter) the main sources of which are the RMHK "Trepča" plant, as well as pollutants of other origin. The concentrations of primary and specific pollutants were determined during the year: nitrogen dioxide, soot, total deposited atmospheric matter and dust, and heavy metals in deposited atmospheric matter (Pb, Zn, Cd, Ni and Cr).
The concentration of lead in certain places in the working and urban environment is lower than the legally limited values for GVI (TLVs). However, during occasional metallurgical processes, the concentration of lead can be significantly increased. The obtained results show that, in the autumn period, the concentration of nitrogen dioxide and precipitable substances is below the limit values, resulting in no significant pollution. The biggest polluting substance in the air is soot, which can be of industrial and other origin, and the concentration of which is slightly higher than the MAC. The highest measured values of soot at certain measuring points were measured in the winter period, although they have a seasonal character of increase. Due to the lead dust in the air and the earlier activities of the industry, it is essential to take all necessary measures in order to create a healthier living space.

Keywords: air pollutants, industry, state analysis, working environment, urban environment

FORESTS OF THE OWNERS (INDIVIDUAL PERSONS) IN THE AREA OF CENTRAL SERBIA, CONDITION, POTENTIAL, RISKS AND CHALLENGES OF MANAGEMENT

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The aim of this paper is to analyze the forest resources that are privately owned by individual persons in the Republic of Serbia, using the example of Central Serbia. About half of the area under forest in the Republic of Serbia is privately owned. These forests are characterized by a large number of owners, a small average size of the cadastral plot under the forest and a small average size of the holding. Also, unfavorable characteristics of these forests are represented by a significant share of coppice stands, insufficient average volume, fragmentation and random distribution of property, disorganized owners and insufficiently clear state strategy in relation to this resource. What further complicates the management of these forests are unresolved property legal relations, as well as the lack of up-to-date data in the Real Estate Cadastre Service, in relation to the situation on the ground. The potential of this resource is great, considering the area on which it is represented in the territory of the Republic of Serbia, as well as the fact that it mostly occupies areas that are less attractive for agricultural production. Bearing in mind that the forest is a renewable resource only under the condition that it is managed in a permanently sustainable and responsible manner, the task of the forestry profession is to reconcile the general state interest and the interest of persons who are private owners. Otherwise, there may be devastation and reduction of forest areas and forest quality, which would negatively affect the entire society and ecosystems.

Keywords: private forests, forest management, ownership, individual persons, potentials, risks, challenges

ROAD SAFETY MEASURES IN THE TRANSPORT OF DANGEROUS GOODS THROUGH TUNNELS

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The transport of dangerous goods in road transport is an area of exceptional importance for the economy, and thus it is attracting more and more attention from the scientific and professional public. The field of transportation of dangerous goods is governed by regulations at the international and national level. Although defined measures are taken, extraordinary events occur in the transport of dangerous goods. There are methods for risk assessment during the transport of dangerous goods, on which the methodology for choosing a route for the transport of dangerous goods is based. Special attention is paid to the risk assessment for the transport of dangerous goods through tunnels. In addition to the appropriate level of training and skills, man as a safety factor has the highest influence on the appearance and emergence of an accident situation, due to inadequate performance or failure to perform prescribed activities during the transport of dangerous goods through tunnels. In order to prevent accidental situations, systems are being developed in tunnels that reduce the consequences of a possible emergency event.
In this paper, an overview of the basic normative documents regulating the field of minimum safety requirements for tunnels on the European road network is given, a literary review of the content dealing with the transport of dangerous goods through tunnels is given, and concluding considerations are given regarding the application of traffic safety measures in transport dangerous goods through tunnels.

Keywords: road safety, transportation of dangerous goods, tunnel

DISTURBANCES OF THE BIOLOGICAL CYCLE OF CHEMICAL ELEMENTS IN ECOSYSTEMS OF MOUNTAIN PASTURES

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The centuries-old use of the northern macroslopes of the mountains of the Alpine orogenic belt for pastures dates back to L.N. Gumilyov from 556.
The structure and parameters of the biological cycle of chemical elements were studied in the landscapes of the sagebrush-grass-forb steppe on chestnut soils at an altitude of 1600-1700 m above sea level, dogrose-forb-tarragon meadow-steppe at an altitude of 1800-2100 m on mountain chernozems, fescue-forb meadow steppe at mountain chernozem-like soils at an altitude of 2100-2300 m, zopnik and manzhetkovy subalpine meadows at an altitude of 2300-2600 m on mountain-meadow subalpine soils, juniper forests on red-colored brown soils at an altitude of 2400-2700 m, secondary pine forest at an altitude of 2500 m, short grass geranium-mantle meadows of the subalpine belt at an altitude of 2650-2870 m, alpine cobresia wastelands on mountain-meadow alpine soils at an altitude of 3000-3400 m. (N60P30K15, N120P60K60, N60P30K30) pastures and hayfields and protected areas since 1967. The yield of the above-ground mass of cereals and herbs was determined separately by the mowing method, the reserves of roots - by the monolith method. In plant tissues, litter and needles, raw ash was determined by the dry ashing method, the content of ash elements, the nitrogen content by the Kjeldahl method, and the content of mineral impurities by the gravitational method.
Based on the obtained data on the chemical composition of plant tissues, the type of biological circulation under the steppe meadows can be determined as magnesium-potassium. Under the alpine meadow, the type of circulation is nitrogen-calcium. In all cases, K, Ca, Mg, and Si predominate in the ash composition. The nature of the biological cycle is high-ash (8-10%), which corresponds to the V point of the scale Bazilevich, Rodin.
Anthropogenic loads have both a direct impact on the magnitude and ash composition of the biological cycle, and indirectly through changes in the species composition and amount of herbage biomass. Indeed, the above-ground mass of grass stands with the highest productivity (in fertilized areas) accumulates chemical elements up to 270 kg/ha, while in the pasture area of unsystematic grazing, the upper limit of the supply of nutrients is 79 kg/ha. At the same time, their main reserve falls on the roots, where these values reach 1500 kg/ha. And, as a result of the concentration of the roots in the 0-25 cm layer, the bulk of the nutrients in them fall on the 0-30 cm layer.
The calculation of the capacity of the biological cycle allows us to conclude that, as a result of the death of the aboveground and underground organs of higher plants, Mg, Si, Ca, Na will return to the soil with litter in all areas, and 81 kg / ha of potassium as a result of haymaking and grazing will removed from it due to its predominant accumulation in the aboveground biomass. The total biomass of fertilized plots in its value - 446 c/ha - exceeds the biomass in the area of unsystematic grazing - 387 c/ha. Apparently, fertilization is a mandatory measure to maintain the productivity of pasture lands.

Keywords: mountain meadows, subalpine ecosystems, pasture rotation, "steppeization"

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THE NEED AND POSSIBILITIES OF IMPROVING THE PROTECTION OF BIODIVERSITY WITHIN THE LEGAL FRAMEWORK - THE CASE STUDY OF THE REVA MARSH

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Reva marsh is located in the east of Belgrade, on the left bank of the Danube river, at about 1200 m from the edge of the river bank, and less than 7 km away from the Republic Square by air. The marsh is part of a wet forest area which has a significant role in protection against floods and strong winds. Reva marsh is the habitat of important and protected plant and animal species, among others the white-tailed eagle and otter. Due to its natural values, wider territory around the pond is protected as an internationally Important Bird Area (IBA) - RS040, under the name ”Ušče Save u Dunav” and belongs to an ecologically significant area of the Ecological Network of Serbia. This habitat, with 80 ha of forest, is threatened by inadequate human activities, logging and the planning of construction of a facility for the disposal of construction waste. In this paper, all laws and by-laws related to the regulation of activities in this riparian area were analyzed and the possibilities of improving its protection were given.

Keywords: conversion of land Reva marsh, environmental impact assessment, habitat destruction, riparian zone

PREDICTION OF NH_3 EMISSIONS FROM THE AGRICULTURE SECTOR USING MLR AND ANN

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The subject of this paper is the examination of the possibility of forecasting the annual ammonia emissions as a result of the agricultural production using multiple linear regression and artificial neural networks. For the development of the models, the annual values of ammonia emissions for two EU countries, Germany and France, for the period from 2014 to 2020. The following agricultural indicators were used as independent variables of the model: sale of pesticides, consumption of artificial fertilizers, area used for crop production and area under organic production. The results of both developed models, MLR and ANN, were compared with the measured values of ammonia emission as a result of the agricultural production, and the performance of the created models was expressed by the value of the statistical indicator of model performance, the coefficient of determination. The obtained results showed a very good agreement between the predicted and measured values for both models. However, a significantly better prediction was achieved using the ANN model compared to the MLR model.

Keywords: ammonia emissions, NH_3, agricultural production, MLR, ANN

PRODUCTIVITY AND PERSPECTIVE OF THE CONCEPT OF ECOLOGICAL MODERNIZATION

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In the introductory part of the paper, ecological modernization will be presented as an executive method of neoliberal capitalism, in both its forms, weak and strong. In the second part of the paper, the effects of ecological modernization will be discussed through statements from its technical-technological side, i.e. it will be analyzed within what it produced in a technical sense, as an independent concept but also as a mechanism of a broader neoliberal discourse of greening the existing system. Within these examples, in a paradigmatic way, it will be established to what extent this executive instrument of capitalist ecological policy is effective in the fight with real environmental problems of today. At the level of the case study, the CO2 emission will be presented, as one of the main enemies of the global environmental policy, because it is targeted as the dominant cause of the effect of climate change, i.e. the increase in global temperature. Thus, we will point out some of the practical, technical-technological contributions of the weak, but only realized version of ecological modernization. The aforementioned will be implemented at three levels - Global, EU and Serbia.

Keywords: Ecological modernization, ecological policy, climate change, CO_2

GLOBAL WARMING

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The industrial revolution has like a double-edged sword brought technological and economic flourishing and development on the one hand, and on the other a great issue to mankind – the destruction and endangering of nature and various ecosystems as well as the functioning of the living world in a way and according to the order which nature itself has created and imposed.

The issue of global warming is a general problem, perhaps the greatest which contemporary mankind is facing, which in a latent and gradual way affects our planet, the physical and mental health of not only humans but also animals, as well as vegetation.

Global warming is a phenomenon which is a result of human negligence expressed through various activities which affect the increase of average air temperatures on Earth. Scientific research states that no country is and will be spared due to global warming and the consequences of that phenomenon.

The causes of global warming are: the emission of greenhouse gases, clearing of forests, loss of snow cover, agriculture, volcanic eruptions. The consequences of global warming are: the melting of glaciers and permafrost which leads to the growth of sea-level, rising of temperatures, expansion of deserts, increase in the frequency of natural disasters such as typhoons, floods, draughts, recurring heatwaves and forest fires, the gradual disappearance of tropical rainforests, expansion of infectious diseases, increase in the number of harmful species of insects, extinction of various plant and animal species, migration of animals, food and drinkable water shortages as a potential danger, disruptions in food chains.

It is necessary for the entire international community to become active and bring common and quick solutions which will efficiently stop climate change.

Keywords: global warming, greenhouse effect, causes, consequences, planet

EFFECTS OF CLIMATE CHANGE ON PROFITABILITY IN CROP PRODUCTION

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The effects of climate change, such as extreme temperatures, droughts, floods, storms, etc., are increasingly worrying farmers. The aim of the work is to find out how income levels and profitability indicators in plant production have changed, and how agricultural farms are adapting to climate change.
The literature review deals with climate change and its causes, effects and adaptation strategies available to farmers. The empirical part is based on a quantitative comparative analysis, for which data obtained through a semi-structured interview with two similar agricultural farms for the period 2018-2022 are used years.
The results show that sales revenues were uneven in the observed period, which was caused by drought and excessive humidity. In 2019, there were many dry periods, so winter crop yields failed. In 2022, the summer was very dry, so very low yields were achieved. The calculation shows that the profit made in all five years is a very variable category, ranging from €5,569 to €183,662 annually. Also, there were years when the change in sales revenue was negative compared to the previous year.
It would be important to choose an adequate strategy for adapting to climate change, in order to ensure the stable development of crop production. These include insurance, preference for conventional practices, early sowing, timing of sowing, building up of seed stocks, use of growth regulators, winter crops and more resistant varieties, which farmers have partly practiced.

Keywords: climate change, crop production, sales revenue, profitability.

MONITORING OF RUPICAPRA RUPICAPRA L. SPECIES ON THE CHOSEN REGIONS OF NATIONAL PARK DJERDAP TERRITORY AND BEHAVIORAL CHARACTERISTICS IN RELATION TO THE PRESENCE OF AN UNMANNED AERIAL VEHICLE - DRONE

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Adequate biodiversity monitoring is of crucial importance when it comes to improving preservation and advancement of ecosystem condition, above all protected areas whose main purpose is to maintain and enhance the state of nature’s values with or without people’s minimal impact. Monitoring is based on field researches which are more often than not limited by various aspects of habitat complexity, logistic and financial support and they tend to not bring adequate results. The number, gender and age structure of the observed species is pretty difficult to determine when it comes to species that have a bit of a hidden way of life and that inhabit isolated land far away from human activities. The goal of this research is monitoring biodiversity centers of chamois population (Rupicapra rupicapra L.) on the chosen regions of the first regime under the protection of National Park Djerdap and behavioral characteristics of individuals that are of interest during the monitoring of species by using the Mavic 2 Enterprise dual drone.

The regions of interest were filmed by the visual camera in a defined timeline during January 2023.

The data from the recordings was materialized and the counting of individuals was done by a detailed review of the recordings from several researchers. Behavioral traits of the observed individuals were determined based on standardized procedure in regards to the reactions of separate individuals to the presence and distance of the drone.

Results show that the usage of drones has a plethora of advantages compared to the previous methods of determining the number of individuals. Based on the given recordings it is possible to precisely determine the absolute number of individuals as well as the wider coverage of the observed area without disturbing them during the process.

Keywords: animal behavior; disturbance; forest ecosystem; machine learning; primates; UAV; wildlife conservation; protected areas

THE INFLUENCE OF ORGANIC PRODUCTION ON THE BUSINESS OF AGRICULTURAL FARMS

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On the basis of the increasingly pronounced concern for health, as well as concern for the protection of the environment and biodiversity, an alternative method of production, known as organic production, was created, which is based on ecological, social and economic determinants. The increase in the area of arable land under organic production, as well as the increase in the number of organic producers at the global level, speaks in favor of the fact that the mentioned concept of production is not just a temporary phenomenon, but a long-term profitable activity, with numerous multifunctional advantages. With an area of 19.317 hectares, or a share of 0.6% in the total area of land under organic production, the Republic of Serbia still lags behind both the world and the European Union average. However, it is clear that the interest in growing ecologically healthy food in our region is increasing, which is especially visible among agricultural farms. The subject of research in this work are agricultural farms in Kosovo and Metohija, which with their characteristics of fragmentation and fertility are very suitable for the development of organic production. Based on the research that was conducted, it was determined that there is a highly statistically significant relationship between the size of farms and several observed variables: the total average income of farm members, including income outside the farms, the type of production they are engaged in, the costs incurred on the farm and the amount of required subsidies.

Keywords: organic production, agricultural farms, Kosovo and Metohija, rural areas

ENVIRONMENTAL TERRORISM AS THE MAIN THREAT TO SUSTAINABLE DEVELOPMENT AND PROTECTION MEASURES

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Environmental terrorism is one of the modern forms of terrorism and the most obvious danger to humanity. This was contributed by significant geopolitical events and global social changes, a reckless fight for the remaining world resources, a fight for the political and military throne. The paper will present environmental terrorism as the main threat to sustainable development. We will try to answer the questions that the development of modern times has led to the activation of protection measures in the fight against environmental terrorism. The research is adapted to the focused problem and is based on a combination of cognitive-theoretical and research activities of practical applicability. With this work, we should send a message to public opinion about the topicality and importance of the problem, both theoretically and practically. It is not enough that only an individual understands the danger of environmental terrorism, but it is also necessary for public opinion to provide great support in preventing environmental terrorism, as the main threat to the global economy.

Keywords: ecological terrorism, ecological standards, sustainable development, protection measures

PESTICIDES AND ENVIRONMENTAL POLLUTANTS IN ORGANIC HONEYS ACCORDING TO THEIR DIVERSITY OF PRODUCTION AREAS IN ORDER TO PROTECT HUMAN HEALTH

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In the last decade, the consumption trend of honey has increased dramatically in the world. The reason is the growing emphasis on the consumption of honey due to its positive effects on health due to the antibacterial and antioxidant properties of honey. On the other hand, pesticides, especially insecticides and acaricides, are the main causes that can contaminate honey and compromise its quality. For that reason, the determination of these pollutants is necessary and important, since the use of pesticides is increasing every year due to the need to produce food, and many of them are in the environment for a long time after use. In this way, bees and honey can be classified as environmental indicators. Modern techniques, such as gas chromatography with mass detection, have the ability to detect a large number of pesticides simultaneously at the trace level. Extraction of pesticides from honey is a great analytical challenge due to the complexity of the matrix containing about 300 chemical compounds from different groups such as sugars (monosaccharides and oligosaccharides), organic acids, amino acids, enzymes, hormones, flavonoids, vitamins, essential oils and sterols. Different approaches based on novel sorbents for clean-up step in preparation procedure have been recently evaluated in order to obtain satisfactory method validation parameters. A quick purification method using dispersive solid phase extraction provides a way to obtain pure extracts with excellent recovery results. In recent years, a large number of scientific publications have developed a sensitive and accurate method for pesticide residue determination in honey samples. The focus of the research was on the validation of the method for the determination of organochlorine pesticides, amitraz and 2, 4 dimethylaniline in honey produced in Serbia. The aim was to validate the method in order to find the most reliable answer to the question about the safety of honey in the territory of the Republic of Serbia and the answer to the question about the presence of pesticide residues in honey. The results of the research are the results of the obtained analyzes on the presence of pesticides in different types of honey from Serbia. Further it gives an overview of the results of other authors, as about the latest results of the examined honey and the presence of contaminants in the surrounding countries.

Keywords: pollutants, organic honey, gas chromatography, pesticides

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ANALYSIS OF EXTREME WATERS IN THE LIM BASIN IN THE TERRITORY OF MONTENEGRO FOR THE PERIOD FROM 2008 TO 2021

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The paper provides an overview of the extreme values of the maximum and minimum flow, which play a significant role in the construction of flood protection facilities and the sizing of hydrotechnical facilities on the Lim River. Floods in the territory of the municipality of Bijelo Polje have been recorded very often in recent years, due to heavy rains that cause the river Lim and its left and right tributaries to overflow from the river beds, causing enormous damage to households, roads, and agricultural plots. Also deposited various waste and rubble, but also the melting of snow are additional factors that cause floods causing enormous damage to the population of Bijelo Polje municipality. Standard statistical methods (Pearson 3, logPearson3, and Gumbel) for the assessment of small and large waters.

Keywords: extreme flows, statistical methods, measuring stations HS Bijelo Polje, HS Ljubovića, HS Bistrica

IMPORTANCE AND DEVELOPMENT OF METHOD FOR PESTICIDE CONTROL IN MILK FROM ORGANIC PRODUCTION

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Pesticides are used to increase agricultural production and destroy pests, but on the other hand they also lead to pollution of agricultural products. Also, through feed and polluted environment, pesticides can contaminate animal products. Plant and animal products produced without the use of pesticides are called organic products. This approach to food production has been developing in Serbia over the last decade, and is much more prevalent when it comes to plant foods, compared to foods of animal origin. Organic production is part of ecology and sustainable development, which in addition to food production includes organic production of products of plant and animal origin, such as textiles and leather. By combining good elements of tradition in agricultural production, innovation and science, satisfactory results in organic production are achieved. In recent years, the demand and production of plant and animal organic products has increased. As far as organic animal products are concerned, the most common are: organic milk, organic yogurt, organic cheese and organic eggs. Also, organic production and animal husbandry require strict controls of the safety and presence of pesticides. The aim of this paper is to establish and validate a method for controlling the presence of pesticide residues in milk from organic production. So the path to reduced pesticide use, use as few toxic solvents as possible, and control pesticides present in food leads to a green economy. The green economy aims to reduce environmental risks, and it is in this way that controlling environmental resources reduces environmental destruction.

Keywords: organic milk, organic production, green economy, pesticide residues

BROWNFIELD INVESTMENTS IN SERBIA WITH THE AIM OF REDUCING CO_2 EMISSIONS AND PRESERVING THE ENVIRONMENT: CASE STUDY

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This paper aims to point out the potential of Brownfield investments of the Republic of Serbia. Abandoned industrial plants and ruined complexes, usually located in parts of the city that were the core of development during the Industrial Revolution, in developed countries are not a mockery like ours, but very attractive places that breathe new life. The so-called Brownfield investments, which, in addition to reviving old buildings, also include the revitalization of polluted construction land, have been current in the world for about two decades. This paper examines the possibilities of adapting and reuse an industrial building in Novi Pazar into an office building, with the use of passive solar systems, with the aim of reducing CO_2 emissions and environmental consequences. The energy characteristics of the building were obtained using the DesignBuilder software and the EnergyPlus simulation platform, taking into account the parameters of the required internal temperature and climate data for the Republic of Serbia. The methodological approach in this research implies the development of a scenario for the rehabilitation of a specific industrial facility according to whose properties the possibilities of energy rehabilitation were investigated by numerical simulation and a comparative analysis of the obtained results of required heating and cooling energy and CO_2 reduction.

Keywords: brownfield investments, energy efficiency, CO_2 emissions, solar energy, energy rehabilitation, adaptation.

PREDICTION OF AIR QUALITY PARAMETERS ON THE TERRITORY OF THE CITY OF VRANJE USING VNM AND ECONOMIC AND INDUSTRIAL INDICATORS

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The subject of this paper is the examination of the possibility of predicting the concentration of air quality parameters (SO_2, NO_2 and soot) on the territory of the City of Vranje using artificial neural networks. For the development of the model the average annual concentrations of air quality parameters obtained by manual methods in the Institute of Public Health Vranje for the period from 2016 to 2019 and economic and industrial parameters obtained from the database of the Republic Institute for Public Health were used as input data. The data from the measuring station of the "Svetozar Markovic" school were used to train the network, while the testing of the network was performed with data from the measuring station of the Institute for Public Health. Correlation analysis determined the correlation between economic and industrial parameters and the concentration of air quality parameters in the city of Vranje. The results of the correlation analysis showed a high correlation, which indicates that the initially selected input parameters for the development of the ANN model are adequate.The results of the developed model are compared with the actual values of the concentrations of the tested pollutants and the performance of the created model is expressed by the value of the statistical indicator of the performance model, by the coefficient of determination R^2. The obtained results show that the best prediction of the model is achieved in the case of soot, while for the other two parameters of air quality, SO_2, NO_2, the model shows slightly weaker prediction results but satisfactory.

Keywords: Air quality, artificial neural networks, air quality parameters, SO_2, NO_2, soot.

Section 4

THE ROLE OF INSTITUTIONS IN FINANCING ENVIRONMENTAL PROTECTION

Sekcija 4

ULOGA INSTITUCIJA U FINANSIRANJU ZAŠTITE ŽIVOTNE SREDINE

FINANCING SUSTAINABLE DEVELOPMENT UNDER THE LEGISLATION OF THE REPUBLIC OF SERBIA: DEFICIENCIES AND PROPOSALS FOR IMPROVEMENT

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The three inseparable components of sustainable development are the economy, society and the environment. The aim of this paper is to analyze the shortcomings of institutional frameworks, financial reporting and incentive financing by financial institutions that would contribute to the improvement of the concept of sustainable development. The problem has been analyzed through the prism of the United Nations Agenda 2030, and the achievement of 17 sustainable development goals, which in Serbia are currently seen more as formal obligations to the United Nations than as a fundamental direction of sustainable development. In the Republic of Serbia, the transparency of sustainable development is still not at an enviable level, there are still no binding national standards for reporting on sustainable development, and the lack of funds to stimulate the achievement of sustainable development goals is evident in both the population and the economy. Proposals for improvement within the institutional framework as well as ways of financing that would stimulate awareness of important aspects of development that go beyond economic growth, profit, employment and mobilize certain ministries within the Government of the Republic of Serbia to pay more attention to social welfare, human health and preservation environment, because we borrowed nature from our descendants, not inherited from our ancestors.

Keywords: sustainable development, financing, institutional frameworks, shortcomings of institutional frameworks, stimulating financing, biodiversity

FINANCING OF ORGANIC PRODUCTION AND ITS IMPACT ON THE DEVELOPMENT OF RURAL, ETHNO, AND ECO-TOURISM IN SERBIA

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The increase in the number of inhabitants on planet earth consequently leads to the need to produce more food. Man's survival on earth is impossible without providing a sufficient amount of food. Conventional food production with the use of pesticides, herbicides and artificial fertilizers leads to the degradation of agricultural resources and endangers the healthy environment. One of the basic human rights is the right to a healthy environment. This right can be ensured by a balance between the food needs of about 8 billion people on planet earth and ecological requirements and preservation of a healthy environment. This balance is achieved by applying the concept of sustainable agriculture, which implies providing a sufficient amount of healthy and safe food and preserving the environment. An increasing number of people are interested in healthy food. Completely safe and healthy food for humans and animals is organic food. The production of organic food is conceived in a way that protects the environment, protects all existing resources, is economically sustainable and socially acceptable. As a result, rural, ethnic and eco-tourism is gaining more and more importance. These types of tourism, in addition to enabling rest in nature in a healthy environment, promote the production of environmentally friendly, safe and correct (organic) food.

Keywords: sustainable agriculture, production, organic food, rural, ethno and eco-tourism

SPECIFICITIES OF FINANCING SUSTAINABLE DEVELOPMENT BY KRAUDFANDING

Biljana Pejović

AP PRODUCTION

Crowdfunding as a way of financing provides the possibility of collecting small funds from a large number of investors for the initiation of planned projects. Crowdfunding provides the opportunity to finance environmental protection projects and humanitarian projects with the help of the wider social community. A well-presented idea on the crowdfunding platform provides the opportunity for a large number of investors to participate in the realization of sustainable development projects. Crowdfunding relies on the strength and size of the community. In sustainable development projects, it is difficult to quantitatively express the effects of planned projects. For the implementation of projects, information on the financial profitability of projects, which is primary for most forms of financing, is not obligatory. Realization of these projects in the long term contributes more to the socio-economic community and the implementation of the concept of sustainable development. With this method of financing, everyone who is interested in the implementation of the project helps to make it happen with their monetary donations. In the paper, the advantages of financing sustainable development through crowdfunding were pointed out using the method of comparative analysis and the synthesis of the specificities of various forms of financing. The advantages of crowdfunding compared to other sources of financing are: speed and accessibility, market coverage, feedback from funding participants, complete control, creating interest among participants and a large number of platforms that can be chosen for project implementation.

Keywords: crowdfunding, financing, sustainable development

CHALLENGES OF FINANCING ECO-TOURISM IN REPUBLIC OF SERBIA

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Tourism development has a positive impact on the global economy. However, many countries, even more developed in relation to Serbia, face the problem of disturbed the concept of balance of environmental, economic and socio-cultural components as well as the specifics of tourist attractive regions. The topic of this paper is focused on the possibilities of formulating a new concept of ecological tourism, i.e. ecotourism, in order to balance all the components of the tourism product (attractive resources, infrastructure, equipment, organization, activities and experience). The aim of this paper is to preserve the social, cultural, religious authenticity and natural balance of the areas visited by tourists. Also, the goal is to promote the undisturbed natural environment and destinations that are rich in preserved natural beauty and ethno-environment, as well as that tourism development in these areas must be adapted to environmental sensitivity. The subject of this paper is to identify potential sources of funding and challenges for the development of ecotourism in Serbia. The paper presents examples of the most successful countries in this field and the main features in the development of ecotourism in Serbia. Serbia has rich natural attractions that have not yet been used as tourist potentials, as well as the main obstacles in the development of ecotourism for all potential ecotourism destinations in Serbia.

Keywords: Ecotourism, regional development, Infrastructure, rural development, financing, Serbia

POSSIBILITIES AND PERSPECTIVES OF DEVELOPING ECOTOURISM IN MUNICIPALITY OF ZVEČAN

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Favorable natural and climatic conditions, significant cultural and historical heritage as well as the traditional people hospitality are just some of the reasons why local and foreign tourists visit municipality of Zvečan, in the north of Kosovo and Metohija. In the last few years, thanks to the funds of Government of the Republic of Serbia, a lot has been done in terms of economic development and, above all, the development of tourism in these areas. The subject of this paper will be an analysis of the current state of tourism as well as opportunities and perspectives in the direction of the development of ecotourism, as an increasingly popular type of tourism in the world today. Also, in SWOT analysis, attention will be given to the important obstacles that stands on this way. Considering the importance of sustainable development, the authors will present proposal in the paper that would influence, firstly, that the entire municipality would be a nicer and cleaner place to live for its residents, and secondly, that would be a much more attractive destination for tourists to visit and return to again and again.

Keywords: ecotourism, tourism, Zvečan municipality, economic development, sustainable development

SUSTAINABLE DEVELOPMENT AND COVID-19: STATE MEASURES AND FUNDING PROBLEMS

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In 2015, the United Nations Conference on Sustainable Development was held in New York, at which a new Sustainable Development Program until 2030 was adopted, the so-called Agenda 2030 contains 17 new goals that are a replacement for the Millennium Development Goals that were valid for the period 2000-2015. years. As a signatory country, Serbia has committed itself to nationalize the goals and work on achieving them These are very complex goals, the realization of which requires great efforts. In this process, Serbia, like all underdeveloped and developing countries, is facing a number of problems. The already existing problems in the implementation process were additionally affected by the crisis caused by the Covid-19 pandemic. Causing confusion and major socio-economic and political problems on a global and national scale, Covid-19 has had an equally dramatic impact on environmental issues. In this regard, we have tried to see in this paper the way in which Covid-19 and certain measures (primarily economic) adopted by the state of Serbia in order to control the crisis, influenced (or could affect) the process of achieving those goals from the 2030 Agenda relating to environmental and climate issues.

Keywords: sustainable development, Agenda 2030, pandemic, Covid-19, crisis

ECOTOURISM: FAMILY AND CULTURAL VALUES SYNERGY

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Ecotourism is a concept of modern society, created as a result of the desire not only to protect the environment, but also the economic prosperity of local communities. The beginnings of eco-tourism date back to the 70s of the twentieth century, only to get their full expansion after the World Economic Crisis in 2008. Today, while the Covid pandemic still leaves its mark on both the physical and mental health of the individual, with a great impact on remembering and returning to "original" goods, individuals recognizing and understanding the importance of both personal and health of their environment, especially nature, they are looking for a new form of "consuming" tourism. Tourism in which they will get to know nature, enhance its beauties by not polluting it, but also by getting to know the traditions and culture of the region they visit. The paper deals with the explanation of the concept of eco-tourism, the degree of representation in the Republic of Serbia and the region, with reference to the fact that with the eco-tourism of families, family values are regained in importance. Namely, along with eco-tourism, families together "work", together they are in "action" and family members are turned to each other during the entire vacation. In addition to the above, visiting places that enable the realization of eco-tourism, always brings with them new knowledge about the tradition and culture of the area, which further contributes to the synergy of family, family values and emphasizing the importance of nature around us.

Keywords: ecotourism, nature, tradition, culture, family synergy, Republic of Serbia

ECOTOURISM AS A DEVELOPMENT CHANCE OF RURAL AREAS IN KOSOVO AND METOHIJA

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Years ago, the inhabitants of Kosovo and Metohija were instructed in what they have at their disposal, and that smart and enterprising people use that as a way of survival. Many villages remain empty, which in turn leads to a reduction in agricultural production. Rural areas in Kosovo and Metohija are areas of exceptional natural value and as such can be presented as true ecological oases characterized by tradition, culture and great diversity of ethno-cultural heritage. The natural potentials of Kosovo and Metohija represent a good basis for the development of ecotourism, and further progress could affect the sustainable development of the entire area. The paper pays attention to the interdependent relationship between ecotourism and the environment. Based on the conducted research, it was determined that the population of Kosovo and Metohija, in predominantly rural areas, highly appreciates the importance of ecotourism and recognizes its positive impact on local development. Therefore, the research determined the accelerated trend of progressive investment in environmental protection in the Kosovo Mitrovica and Kosovo districts, which is primarily for the improvement of ecotourism. The authors of this paper presented the current level of ecotourism development in rural areas in Kosovo and Metohija and gave suggestions for solving existing problems, in order to provide the most rational way of living in rural areas, through the process of creating tourism products and services, taking into account about the environment.

Keywords: ecotourism, rural tourism, sustainable development, environment, Kosovo and Metohija

POTENTIAL REQUIREMENTS FOR ECOTOURISM IN INDUSTRIAL AREA OF KOSTOLAC

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Abstract: With analyses of industrial areas and their cultural potential, with application of rational project solutions for organisation of degraded lands. We define elementary basics for creation of better quality ambient, while we protect environment. There is a need to start remediation of all lands, which are left to natural existence. Visualisation of industrial complex of Kostolac, archaeological site, historical monuments and landscape features of surrounding area precedes the establishment of ecological balance in wider area and development of ecotourism.

Keywords: Archeological site, industrial complex, organization

ECOTOURISM AND THE IMPORTANCE OF HUMAN RESOURCES

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Ecotourism is a type of tourist economy that takes place in a preserved natural environment, based on both natural wealth and the socio-cultural dimension of development. Ecotourism should therefore be an ideal form of tourism because the "business conducting" is regulated following the preservation of biological and cultural values of a particular area. As an activity, this form of business appeared twenty or more years ago, intending to improve the economic situation in certain poor, rural regions, as well as to raise the environmental awareness of the inhabitants of these areas. Ecological tourism is becoming more important because it enables the inhabitants of rural regions to use their natural potentials and thus improve their quality and way of life. Ecological tourism can be understood as tourism of rural areas, and it should mostly help the development of these areas, to become economically and socially strengthened. Based on the fact that the tourism industry is a very specific way of business because people are on both sides of the business process, human resources in the field of ecotourism are the essence of quality. Proper guidance and coordination of employees in tourism lead to greater job satisfaction, while good motivation can pay off through better service delivery. This paper aims to provide the basic determinants of ecological tourism, but also to point out the importance of the human factor for the business of this type of tourism economy. The authors point to the sustainability of tourism business from both the economic and social side of development, and since eco-tourism is based on natural values, the environmental component of sustainability is certainly included. The paper aims to highlight the negative consequences of conventional tourism in favor of ecological business, to point out the importance of local communities, which represent human resources in this type of tourism economy.

Keywords: Ecotourism, natural environment, human resources, social interests, local communities

WHAT ARE THE DRIVERS OF COMPETITIVE ADVANTAGE COMING FROM GREEN INTELLECTUAL CAPITAL DURING 2022 GLOBAL ECONOMIC CRISIS?

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This research article aims to investigate the drivers of competitive advantage coming from green intellectual capital in S&P 500 biggest US companies in the period of 2022 global economic crisis. A qualitative lexical content analyses were done on 226 corporate news from 1st of January 2022 until 31st of December 2022, with 4.509.138 words and 12.856 pages. The research study identified 5 main drivers: (1) sales; (2) cash; (3) products and services; (4) shares, and (5) leadership. The paper proves that biggest US companies listed on New York Stock Exchange (NYSE) and indexed on S&P 500 index highlighted sales, cash, products and services, market shares and leadership as 5 main drivers of competitive advantage during 2022 economic crisis. The paper contributes to the literature by proposing precise drivers that influence positively on company's long-term advantage, however, the specific drivers of this relationship have not been fully explored until now. The findings of this study provide insights for organizations looking to leverage green intellectual capital for sustainable performance and competitive advantage.

Keywords: green intellectual capital, financial performance, competitive advantage, S&P 500

INSTITUTIONAL SUPPORT FOR THE DEVELOPMENT OF CIRCULAR ECONOMY

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Innovations in the field of communications, technology, use of materials, production processes, etc., in the last few years have created space for a strategic turn towards the concept of circular economy. The circular economy is a “tool” for achieving the goals of sustainable development and implies long-term investment in raw materials and energy efficiency, with the reduction of harmful emissions, replacement of fossil fuels with renewable sources and production and trade in sustainable products. The circular economy in Republic of Serbia has significant potential for development. However, how and in which direction it will further develop largely depends on the established dynamic balance between incentives and measures for its emergence, growth and development, and the changes and challenges they will face in the coming period. In the first place, in order to encourage the development of the circular economy, it is necessary to adopt a comprehensive strategy on how to approach this model and work on it.

Keywords: sustainable development, circular economy, potentials, constraints, institutional support

SELECTION OF FACTORS INFLUENCING GREEN INNOVATION USING THE AHP METHOD

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Green innovations include all forms of innovation that minimize damage to the environment and make a significant contribution to sustainable business. The development of green innovations is influenced by various factors. Knowledge management helps organizations build the capabilities necessary for green innovation, which further enhances sustainable business. Green innovations, derived from knowledge management processes, contribute to the development of environmentally friendly operational processes and products. To accept green innovations, it is necessary to change the culture, both the way of life and business, which can be achieved through constant learning, application of knowledge and innovation. The goal of the paper is to rank the social and cultural factors that influence the development and application of green innovations, using the AHP method, and thus obtain the most influential factor. Organizational learning, organizational culture, leadership, knowledge management and financial resources discussed in the paper. The results showed that knowledge management is the most influential factor on the development and implementation of green innovation.

Keywords: Sustainable business, green innovation, AHP method.

BLOCKCHAIN AS BASIS FOR ECOSYSTEM MODEL INSURANCE IN INTERNATIONAL BUSINESS

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Blockchain technology plays an increasingly important role in achieving sustainability in business practices through resources for extending the life cycle of a given product and maximizing their use. Most of the Blockchain literature is devoted to the general financial sector with an emphasis on the banking sector. It observes the limited attention paid to other financial sectors, especially insurance sector, and responds how to adopt Blockchain technology as digital transforming components of the business model in the insurance industry.
The possibilities of Blockchain application in insurance are numerous, from the processing of compensation claims and fraud detection, payment, data structuring to reinsurance etc., which leads to a significant increase in efficiency, cost savings, transparency, faster payments, with the sharing of data in real time between different parties in a reliable and traceable manner the way. Especially, Blockchain technology brings the higher security in business network and smart contracts.
The authors analyze in the paper Blockchain as basis for ecosystem model insurance in international business and proposed empirical model for Blockchain implementation in insurance network and business processes.

Keywords: Blockchain, Insurance, International Business and Ecosystem Model.

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ENTREPRENEURIAL ASPECT OF THE CONCEPT "POLLUTER PAYS"

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Intensive economic development, growth of production and consumption, as well as the growth of world population triggers the increased consumption of non-renewable natural resources and uncontrolled pollution of environment. One of solution imposed is the principle "the polluter pays", which considers that the polluter is responsible for environment pollution and is obliged to pay defined taxes and stamp duties. On the other hand, the solution could be in applying new technologies that may decrease the environment pollution and promote the production of renewable energy sources and develop recycling industry. Entrepreneurs have distinctive role in this process as they are the most flexible and innovative part of economic system. Their role reflects in their speed and readiness for introduction of new technologies and innovation, as well as applying the principles of green economy.

Keywords: environment, pollution, green entrepreneurship, green economy, recycling industry

THE ENVIRONMENTAL ACCOUNTING AS A FACTOR IN SUPPORTING THE DEVELOPMENT OF THE GREEN ECONOMY

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The intensification of climate risks and increasingly rigorous environmental regulations as part of the overall efforts to achieve sustainable development of society and the green economy required an adequate response from the accounting profession in the form of environmental accounting. This segment of accounting seeks to prepare information on environmental performance, for the purposes of environmental risk management, as well as to connect the environmental and financial dimension of business. The paper discusses the environmental reports of large companies in the field of agribusiness and natural resources exploitation that operate in the Republic of Serbia, since their business directly affects the degradation of the environment. The aim of this paper is to point out the importance of environmental accounting and reporting on environmental performance, as well as to analyze the quality of disclosed information in this segment of reporting in domicile practice.

Keywords: environmental accounting, eco-efficiency, environmental performance, green economy

GREEN FINANCE AND ACCOUNTING APPROACH SUPPORT IN THE FUNCTION OF SUSTAINABLE ECONOMIC DEVELOPMENT

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Green finance is recognized as a direction that has positioned itself between the industry on finance, sustainable economic development and environmental protection. Undoubtedly, this is a very young form of finance, which originated from modern economic development in which there was a confrontation of theoretical and practical economic point of view in relation to environmental awareness, but above all in relation to environmental rationality.
The last decade in the world has been defined by a wide public recognition that the global financial system should actively contribute to sustainable development, which has made the concept of green finance more pronounced. This was especially influenced by the processes of environmental management in the economic sector. The tools of environmental management, green economy and green finance have also placed emphasis on environmental management accounting. Management accounting produces financial and non-financial information, which needs special attention and awareness, because the areas of wider importance include the calculation of environmental costs and corporate reporting on the environmental performance of the company.

Keywords: green finance, green economy, sustainable development, environmental protection, costs, reporting.

ENVIRONMENTAL ASPECTS OF REPORTING OF LARGE-SIZED ENTERPRISES IN SERBIA

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One of the key goals of the sustainable development of socially responsible companies is reducing the business impact on the environmental. Having in mind that the production processes and technologies of companies from various activities carry a larger or smaller risk for the environment, the paper points out the importance of ecological business orientation and transparency of reporting on the impact of activities on the environmental. The aim of the paper is to analyze the level of information disclosure on environmental impacts, environmental protection and quantitative environmental parameters of a selected group of large-sized companies in Serbia, that are classified as the subjects of non-financial reporting according to the national accounting regulations. In a separate part of the paper, emphasis is placed on the analysis of the practice of presenting sustainability reports that are compiled in accordance with an internationall accepted methodology. Despite the progressive growth of the importance of sustainable activities, the majority of analyzed enterprises do not present quantitative environmental indicators.

Keywords:, environmental protection, sustainability, non-financial reporting, environmental parameters, large-sized enterprises

THE IMPACT OF CORPORATE SOCIAL RESPONSIBILITY ON SUSTAINABLE BUSINESS

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This paper explores the relationship between corporate social responsibility (CSR) and sustainable business practices. It will present the impact of CSR on a company's financial performance and reputation, as well as its influence on the environment, society, and overall business sustainability. The paper first provides an overview of relevant literature on this topic. This is followed by a presentation of the results of the conducted study, which were analyzed using statistical methods and tracked the dynamics of the analyzed parameters over the past eight years, from 2015 to 2022. The results show that companies that prioritize socially responsible business activities, such as caring for employees, investing in social innovations and safe products, minimizing environmental impact, and donating to the community, tend to have a positive impact on their financial performance and reputation. Furthermore, there is a higher likelihood that consumers, investors, and other stakeholders will view these companies as responsible and trustworthy, which can lead to increased brand loyalty and recognition. The results suggest that socially responsible business practices should be an integral part of a company's business strategy if they aim to become sustainable and remain competitive in today's rapidly changing business environment.

Keywords: Corporate Social Responsibility, Sustainable Business, Environmental Protection, Public Relations, Competitiveness

NON-FINANCIAL REPORTING ON THE ENVIRONMENT AND SOCIAL RESPONSIBILITY

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This paper aims to examine the quality of non-financial reporting in the light of the application of Directive 2014/95/EU depending on whether the states apply or do not apply the mentioned directive. The research method in this paper is content analysis, whereas the subject of research will be 26 sampled scientific papers dealing with NFI. This study shows that the quality of NFIs increases when switching from voluntary to mandatory. This result shows that preparers can perceive mandatory NFIs as comprehensive best practice for adequate reporting on their social, economic and environmental impacts. The contribution of this research is manifold. First, it contributes to the accounting literature on social and environmental issues that focus on assessing the quality of NFIs. Second, it contributes to the literature that emphasizes the role of laws, coercive and normative mechanisms in accounting systems and reporting practices. Third, paper contributes to research gaps in the literature related to corporate reporting as a consequence of normative requirement and the relationship between regulation and law, coercive and normative mechanisms within organizations and states.

Keywords: Directive 95/2014/EU, non-financial reporting, environmental protection, mandatory disclosure

PLANNED OBSOLESCENCE AS A MANUFACTURER'S CORPORATE STRATEGY – CONCEPTUAL DEFINITION, IMPLEMENTATION CONSEQUENCES AND LEGAL REGULATION

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Planned obsolescence is a corporate policy of creating products with artificially limited useful lives or deliberately weak designs. The term includes all strategies that increase the rate of product replacement by shortening its life before the optimal term, both in a technical and psychological sense. The negative consequences of planned obsolescence include material damage to consumers by violating their rights, but also the effects that an insatiable production policy has on the environment and ecological sustainability through the excessive waste of natural resources in production processes and the accumulation of waste. However, defining planned obsolescence is a challenge for science, given that the manifestations of the strategy are multiple, legal regulation is just starting to emerge, and multidisciplinary approach to the problem is required before establishing clearer standards. Therefore, the authors observe the existing judicial practice, the pioneering legislative example of the French Consumer Code, which sanctioned planned obsolescence for the first time, and the existing initiatives and the perspective of the regulation of this issue in the European Union, which for now has the form of non-binding soft law instruments.

Keywords: consumer law, planned obsolescence, corporate environmental responsibility, European Union law, environmental protection

THE IMPACT OF CYBER SECURITY ON THE HOTEL INDUSTRY AND THE ENVIRONMENT

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In terms of global tourism business, tourism constantly faces crises that affect its development. Tourism has resulted in the decline in tourism traffic and tourism receipts, with major or minor impacts on global tourism trends. With high technology comes high-tech crime known as cybercrime that is committed in cyberspace. It covers all actions that are not allowed in the “real” world. The paper explains the importance of cyber security in the operation of the hotel, but also the impact on the ecological environment in tourism. Cyber attacks use innovative techniques that are increasingly difficult to detect attackers with a general tendency to increase attack automation. This means that the results of the action can have different types of consequences for the target systems, which can be manifested on the physical, logical and informational level. A destination or business brand can suffer great damage.

Keywords: Security, ICT technology, misuse, computer networks, hotel industry

PEACE, JUSTICE AND STRONG INSTITUTIONS AS THE SUSTAINABLE DEVELOPMENT GOALS: ASPECTS AND PRACTICE IN THE REPUBLIC OF SERBIA

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Abstract: Pragmatism that contributes to achieving the goals of sustainable development provides clear guidelines for the priorities of global and national environmental challenges as a whole. The philosophical categories of peace and justice are essential components of establishing strong, independent and autonomous state institutions in their work. On the path of its modernization, the Republic of Serbia managed to respond, in part, to the challenges of modern social and financial flows, and on that path and in that process, it achieved notable results. The aim of this research is primarily to show the general importance of peace and justice as philosophical categories that make up the body of all progress, to talk about these categories from a metaphysical, sociological and legal aspect, but also to show the economic factor within a country institution. The strength of an institution is reflected in the results of its work, which are measurable by the practical growth of the quality of life of citizens. The ultimate goal of the research is the incorporation of research results into the practical application of sustainable development goals in the Republic of Serbia, all in accordance with the 2030 Agenda.

Keywords: Peace, justice, strong institutions, sustainable development, economy, progress, 2030 Agenda

PERCEPTIONS OF GREEN HUMAN RESOURCE MANAGEMENT: A COMPARISON BETWEEN PROSPECTIVE AND CURRENT EMPLOYEES IN SERBIAN CONTEXT

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The global framework in which contemporary organizations operate has established the ecological aspect of sustainable development as an imperative for their success. The process of their greening begins with raising employees' awareness about the importance of environmental responsibility, which is why scholars and practitioners are becoming more interested in green human resource management practice. While this matter remains at the exploratory stage in the Serbian context, the necessity to determine the perceptions of prospective job seekers and present employees on the aforementioned practice is recognized. In this regard, a pilot study on attitudes toward green human resource management practice was done. Employees and students participated in the pilot study, with both samples comprising 30 respondents. By comparing the acquired attitudes, we obtained suggestions for staffing in the domain of the development of green human resource management, as well as creating the hiring strategy from the perspective of the adopted companies' green policies. The study has the stated practical implications in addition to its theoretical contribution.

Keywords: green human resource management, employees, students, Republic of Serbia

DIGITAL SKILLS IN THE FUNCTION OF SUSTAINABLE TOURISM IN SERBIA

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Tourism has experienced exponential growth in traffic in the last twenty years, which has dramatically emphasized the adverse effects of this industry on the environment. Through the increase in the number of visitors, the impact is transferred to the expansion of traffic and necessary infrastructure, construction of facilities and urbanization, which consequently affects climate change, endangering plant and animal species, and water and air pollution. With an aim to prevent further deprivation of natural and tourist resources, it is necessary to invest a systematic and continuous effort, and one of the possibilities is the use of digital technology in tourism. There are numerous examples of the use of technology in tourism, which became especially important during the Covid crisis when the need for contactless possibilities of communication, payment and similar. The most important digital concepts applicable in tourism are computer simulation modelling, electronic destination management systems, environmental management information systems, GPS, wireless and mobile technology, virtual tourism and gamification. However, it should be borne in mind that the successful implementation of digital solutions requires an appropriate level of digital skills of stakeholders. This paper aims to determine the level of digital skills of the able-bodied population engaged in the provision of services based on microdata of the Republic Statistical Office of RS to determine whether there is a sufficient level of skills for digital technologies in tourism in Serbia.

Keywords: tourism, environmental impact, digitalization, digital skills, Serbia

DOCUMENT DIGITIZATION FOR ENVIRONMENTAL PROTECTION

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Global changes, which we have witnessed in recent decades, point to the benefits of digitization and the use of digital technologies in various spheres of society. Digitization significantly impacts how individuals function and communicate in private and business environments. The use of digitized online documents facilitates the way of doing business, but there is a great impact in the context of environmental protection through sustainable work processes. Therefore, it can be said that one of the numerous goals of the transition to "digital" is the aspiration to create an ecologically sustainable and healthy society. Using digital materials significantly reduces paper consumption, reduces air pollution that comes from gases during the production or transport of printed materials, and at the same time, CO2 emissions can be reduced to a minimum. As ecologically sustainable systems for storing digital documentation, regardless of origin and purpose, digital repositories have emerged - systems for digitally preserving various materials that can store tens of thousands of items online. Systematic storage and enabling access from any place at any time contribute to protecting the environment because the processes that can affect its deterioration over time are minimized.

Keywords: Digitization, Digital libraries, Environmental protection, CO2 reduction

THE IMPORTANCE OF DIGITALIZATION FOR THE SUSTAINABILITY OF ACCOUNTING

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The digital transformation is bringing big changes in accounting. Wide acceptance of these changes requires more technological competencies and knowledge of accountants. Modern technologies require adjusting the way accountants work (switching to the so-called online-real-time mode). With the application of information technologies, the work of accountants has been facilitated and simplified, with the creation of better and more accurate data.
This paper contributes to the dissemination of knowledge about the use of digital technologies in accounting. The most commonly used digital technologies are Cloud, Blockchain, Big Data, Artificial Intelligence, etc. In Europe, new digital technologies are used to a relatively low extent due to the complexity of business processes, high prices of new technologies, the company's internal regulations, etc. However, there is a growing awareness of the need to open an accounting function for new technologies. The research is based on a review of relevant professional and academic literature.

Keywords: digitization, cloud accounting, blockchain, big data, visualization tools

THE IMPACT OF THE PANDEMIC ON DIGITAL TRANSFORMATION IN THE FIELD OF ORGANIZATION OF BUSINESS IN ENTERPRISES IN SERBIA

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The main goal of the research is to examine how the situation caused by the COVID-19 pandemic affected the digital transformation and changed the business models in companies in Serbia. The purpose of the research is to identify and analyze the impact of the pandemic on the organization of work and other organizational performance of companies and their employees in our country. The data were collected through an online survey of a sample of 62 companies, and then processed using the statistical program SPSS 21. The results of the research indicate that COVID-19 has caused significant changes in the way companies operate in Serbia. Many had to rethink key elements of their business processes and adapt to modern information technologies necessary for teleworking. Also, it can be noticed that, almost three years after the beginning of the pandemic, despite the problems they encountered, companies and employees have made significant progress in supporting alternative ways of doing business in a business environment. Based on the expressed attitudes of the respondents and the conclusions reached, further research should be focused on the analysis and monitoring in which direction the established trends related to online business in Serbia will change.

Keywords: Online business, COVID-19, digital transformation, information technology

DISCLOSURE OF CLIMATE RISK INFORMATION IN COMPANIES' REPORTS

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Modern ways of reporting on business include financial and non-financial reporting, which includes responsibility to the community and responsibility for nature conservation. In addition to management, investors, lenders, insurance companies and other external users of financial statements are increasingly interested in information on the impact of climate risks on the company's operations, and how they affect the future growth of the company.
The paper will present current legal solutions, guidelines or recommendations related to the disclosure of information on climate risks in developed countries, and the Republic of Serbia, as well as the results of research on the information related to climate risks that companies from the Republic of Serbia disclose in financial and non-financial reports. The research is based on the sample of 20 companies included in the Report on the 100 best companies 2020 published on the official website of the Serbian Business Registers Agency.

Keywords: Financial and non-financial reports, impact, developed countries, disclosure of climate risk, Serbia

THE CONCEPT OF SUSTAINABILITY IN E-COMMERCE

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The emergence of internet and digital channels has strongly affected the business processes and marketing, providing new types of relations with customers in online environment. One of the most significant impacts is made in the segment of trade with the development of e-commerce models. The paper analyses the implications of e-commerce on the environment and indicates the significant sustainability aspects in online trade. The starting point of this research is the global concern regarding the effects of online business processes on CO2 emissions, plastic packaging waste and other ecological implications. The paper uses literature review and actual statistical analysis to provide scientific insight into the sustainability of e-commerce and its business segments such as distribution and transportation. Furthermore, the study concentrates on green solutions for delivery services and contributes to better understanding of ecological footprint in online trading. When analysing the effects of different products traded online particular focus is related to apparel industry which is recognised as one of the industries with the strongest impact on the environment.

Keywords: sustainability, e-commerce, environment, online trade, online business

GREEN MARKETING AND DEVELOPMENT ASPECTS OF GREEN MARKETING IN REPUBLIC OF SERBIA

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The development of society at the global level is closely related to population growth and accelerated industrialization. There are more and more consumers who, due to good information, demand products with specific characteristics. Among them are those who consider the environmental aspects of the products or services they buy. To survive in the market, companies are forced to adapt to such requirements. This is how the concept of green marketing came about.
This paper presents the concept of green marketing, as a new condition for the survival of companies on the market. As the concept of green marketing implies the existence of green elements of the marketing mix, the paper highlights additional requirements that the elements must fulfil to be characterized as green. The aim of this paper is to systematically present an overview of the development of the concept of green marketing and the conditions that must be fulfilled, as well as to indicate the state of development of green marketing in the Republic of Serbia. The general conclusion reached is that this concept is only in its infancy on the territory of Serbia, and that its greater application is expected in the near future.

Keywords: green marketing, green marketing mix, product, price, place, promotion

NEW APPROACHES TO STUDYING GREEN MARKETING FROM THE PERSPECTIVE OF ARTIFICIAL INTELLIGENCE

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The phenomenon that we call the new, or digital, economy has begun to develop significantly in the last few years and is slowly penetrating the modern understanding of the industry shaped by the rapid digital progress of information technologies. The roots of these changes in the economy are caused by the waves of innovation in the world of information technology and its academic studz in universities around the world. A society shaped by new technological innovations requires more modern approaches in the study of this phenomenon. Changes are frequent and welcomed, and they are constantly sought in the scientific world. Digital networking has provided a new, broader picture of what technologies offer us. An example of this is today's more sophisticated programs that allow us to be the ones who will mediate the production process of our unique product in real time. The issue of digital marketing has been transferred to all segments of society. If a company wants to operate in a responsible and socially acceptable manner, it must include the concepts of economy and ecology in its operations. Companies entering the world market must accept the fact that modern society is digitally educated and that only through this approach can they occupy a significant position on the market. Eco-marketing, or green marketing, has attracted a large number of authors in the last decade and requires special attention. This paper provides a view of the emergence of green marketing through the historical framework of the development of information technologies and new application solutions in the field of digital economy and ecology, i.e. the application of artificial intelligence in the field of green marketing.

Keywords: Green marketing, digital marketing, digital economy, artificial intelligence

MARKETINŠKI ASPEKTI UPRAVLJANJA PROJEKTNIM RIZICIMA U RAZVOJU SPORTSKIH EKOLOŠKIH KAMPOVA

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Engaging in sports activities and the issue of environmental protection has become a very important way to ensure health thanks to great media attention. The subject of research in this paper includes the determination or definition of the very phenomena between which the connection is established, as well as the determination of the nature of the connection itself. The subject of the research is promotion as an important factor in successful development in sports, as well as determining the impact on environmental awareness. The theoretical definition of the problem and the subject of research is a logical operation by which the essence of the phenomenon under investigation is determined using abstract terms. Operationally, the working definition of the problem consists in the determination of indicators, that is, indicators that can be examined and checked empirically. The degree of investigation of promotion in sports is high, and given that marketing is an increasingly influential and prevalent area of the economy, that degree of investigation of promotion in sports will rise to an even higher level over time, and it is necessary to investigate the way of its influence on raising environmental awareness. After the operational definition of phenomena is carried out, assumptions or research hypotheses are set. Their function is to assume a connection between the phenomenon we are investigating and other factors that could be assumed to be in some kind of relationship with it. The aim of the research is to check the validity of the hypothesis.

Keywords: marketing, camp, sport, environmental awareness

ENVIRONMENTAL PRESERVATION TRENDS IN MODERN SPORTS

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Every day we are witnessing the collective absence of care, attention, responsibility and awareness of people towards nature and its riches, where man is responsible for disturbing the balance of nature and endangering its biodiversity. Preservation of the environment through the implementation of sports activities and action in this area are necessary due to continuous and systematic investment in the development of society through the active participation of all human factors in the field of environmental protection. Sport is considered one of the global models through which the human population can be influenced, and above all the youth, to raise awareness and make a change in understanding the importance and achievement of environmental goals through education on ways to protect the environment through specific sports activities. Sport is a useful platform for the development of society, necessary for the health of the nation. The connection between modern sports and environmental protection is aimed at providing the necessary conditions for man to reach his full potential, actively participating and contributing not only to their own development through sports activities, but also to the development of society by achieving environmental goals - tasks in their environment. Sports events and activities have a great impact on the environment: large amounts of waste are generated, energy and water consumption increases, traffic congestion increases, air and water are polluted. The synergy of modern sports and environmental protection is a concrete mechanism of action in global strategies of environmental planning and implementation of tasks in the field of ecology and sports. Also, sport is a way to promote an idea based on the principle of activity - ecology - sustainability. The subject of this research are the trends of environmental protection in modern sports, which are reflected in the implementation of various sports activities and concrete actions in the field of sports (“plogging”, construction of ecological green stadiums and sports facilities, etc.). The aim of this paper is to point out a wide range of activities and realistically possible ways of acting in modern sports, which are necessary to achieve sustainability and environmental protection. Through planning, preparation, organization and implementation of activities and events in modern sports, various solutions are found as a necessary model in preserving the environment and sustainability, harmonized with legislative and strategic frameworks for environmental protection and improvement and achieving national and European environmental standards. The results of the research show that in this way it is possible to greatly influence the return of sports and human nature and environmental protection by realizing a number of ideas and tasks, which is a long-term “green sports mission” necessary and important globally for the survival of society.

Keywords: modern sport, environmental protection, sustainability, society, trends

SOCIO-ECOLOGICAL MODEL IN SPORTS MARKETING

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The socio-ecological framework is a very important aspect in the development of health at several levels. In this work, the same was used in order to determine its interdependence with the effective reduction of cases of death in sports. In the research, available relevant literature was used, which examined the mentioned interdependence. The research subject of this paper deals with determining the influencing factors on the health of athletes, while the goal of the research is to determine the most effective way to raise health awareness. Marketing, sport, ecology and sociology are highlighted as the most important segments in the work. Based on the data established during the research, we can conclude that by taking advantage of the opportunities provided by each of these segments, the health of athletes can be effectively improved and the number of deaths can be reduced.

Keywords: sport, marketing, sociology, health, ecology

ECONOMIC EVALUATION OF MINERAL RESERVES, GREEN FINANCE IN THE MINERAL SECTOR AND GREEN ECONOMY

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The economic evaluation of mineral reserves in modern conditions requires adaptation to current trends and taking into account modern requirements that follow the work and business of the mineral sector. The crisis period that also affected the mineral economy, especially the part with energy mineral raw materials, led to a certain change in economic flows, economic movements and economic tendencies, as well as some accompanying aspects. They include not only the change in the source of supply of energy mineral raw materials, primarily oil, gas and coal, but also the way of achieving the set goals regarding the transition to green energy, as part of the green economy. In the conditions of insufficient provision of the necessary energy sources, due to the consequences of the Russian-Ukrainian military conflict, as well as the impact of the EU embargo on the import of Russian oil and gas, as well as the impossibility of quickly switching to other sources of supply, some European countries turned to their own existing coal reserves and started activities on the restart of their exploitation. In this way, black fossil fuels have become acceptable in the short term in the transitional crisis period, even though as such they violate the started green agenda. However, due to very important ecological, sustainable and existential reasons, the long-term orientation towards the continuation of the energy transition to green energy and the development of the economy in the direction of the green economy remains in force. The accounting data of green finance within the framework of the economic evaluation of mineral resources significantly help in seeing the positive sides of this general orientation. Through appropriate analysis of economic evaluation factors and especially related value indicators, expressed through appropriate costs related to ecological aspects of valorization of mineral raw materials, but also savings or income based on the use of green energy, they enable appropriate quantitative expression and certain forms of green valuation. In that part of the contribution of the mineral sector to the green economy as part of the economic evaluation, geological, mining, technological and especially geoecological factors are particularly significant. The first three factors are basic for the process of mineral production from various process-professional aspects and allow to see the conditions for reducing the impact on the environment and cost definition as part of green finance. The fourth factor provides a complete geoecological analysis of the characteristics of the mineral raw material, the ecological state before, during and after the exploitation process with aspects of the impact on the environment. The subject data and information of the economic evaluation enable green quantification and professional-expert expression of the contribution of the mineral economy to the overall development of the green economy of which it is an indisputable part.

Keywords: economic evaluation, mineral reserves, green finance, green economy

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САВЕЗ ИНЖЕЊЕРА И ТЕХНИЧАРА СРБИЈЕ

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