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CONTENT

ENVIRONMENTAL PROBLEMS OF MINING AND PROCESSING OF ZIRCONIUM ORES

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Keywords: *mining, processing, zirconium ores*

Mining is always associated with environmental degradation, which, in turn, is perceived by the local population extremely negatively.

The same problem arose in 2020 near the village of Volodarskoe in Eastern Ukraine. The Azov zirconium ore deposit is one of the twenty largest zirconium deposits in a world. The potential revenue from these deposits is estimated at $ 300 million.

However, the development of this deposit is hampered by the negative attitude of local residents. To obtain objective information, we drilled three wells. The first in the center of the field. The second on the border of the village next to the field. The third is in the floodplain of the river, to determine the possible contamination of drinking water by runoff from the field. a chemical analysis of the cores was performed. Analysis showed the deposit contains 62.4% ZrO_2 and 37.7% SiO_2.

As for the analysis of water, the concentration of zircon in the samples from the center of the deposit is at the level of determination accuracy.

Analysis of surface waters showed no trace of zirconium. Thus, we have proved that the zirconium deposit has no effect on the environment.

However, before further development of the field, preliminary environmental risk assessments should be carried out.

ENVIRONMENTAL IMPACTS OF SELECTED HEAVY METALS ON ENVIRONMENTAL QUALITY AND HEALTH

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Keywords: *environmental impact, heavy metals, environmental quality, health*

Environmental quality is directly determined by anthropogenic activity in interaction with the constantly evolving consumer way of life causing contamination of individual components of the environment, which are characterized by interaction relationships. The effects of anthropogenic activity on the environment are no longer mostly of a local nature, but have taken on a global, global character, as the intensity of exploitation of natural resources, the distribution of various anthropogenic products and the accumulation of various wastes have increased. In connection with the overall chemization of the environment, for example, toxic substances-contaminants that do not fit into stable biogeochemical cycles also enter nature.

Consequently, due to their synergistic effect, they cause various environmental problems that negatively affect not only the abiotic components of the environment, but also the biotic components, as these reach the tissues or the various exposure routes in the food chain. tissue biotic components. One of the risk factors reducing the environmental quality is also heavy metals (TC), which accumulate in the environment and represent non-degradable waste. Heavy metals such as Hg, Cd, Pb, As with their negative effects, i.e. toxicity, carcinogenicity, teratogenicity, mutagenicity cause various chronic and clinical diseases of living organisms. Also for these reasons, more and more emphasis is currently placed on monitoring the impacts of TCs on environmental quality, resp. on the quality of biotic and abiotic components of the environment.

Environmental problems are already becoming global and the overall situation is perceived as more than unsatisfactory, including in Slovakia. WHO estimates that approximately 25% to 30% of health consequences can be attributed to negative environmental factors. Current knowledge about the environment, including the link to the food chain and related so-called the environmental health of the population is becoming a priority in the ranking of the situation and at the same time a memento for future generations.

FRESHWATER SHRIMP *NEOCARIDINA DAVIDI* – PERSPECTIVE MODEL ORGANISM

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Keywords: *Neocaridina davidi, model organism, chemical polutansts*

Within the framework of the European Convention for the Protection of Vertebrate Animals used for experimental and other scientific purposes, one of the main requirements is to limit the number of animal experiments to a minimum, which requires the search for new suitable invertebrates.

Neocaridina davidi freshwater shrimp is a suitable and prospective organism for testing the toxicity of chemical polutants in the environment, given the unpretentious breeding and rearing. This species reacts sensitively to the change in the chemism of the aquatic environment by increased physical activity, reversible and ireversible paresis, undulation of the exoskeleton and when the limits are exceeded leading to death. Due to their relatively long survival (approx. 2 years) and high sensitivity to chemicals, in addition to responding to acute environmental toxicity, the impact of long-term exposure to subliminal levels of chemicals from the pesticide group can be monitored.

In recent years, this type of freshwater shrimp has become more widely used in testing the toxicity of insecticides (imidacloprid, dimethoat) in the aquatic environment and has also proven to be suitable for microplastic retention research.

Kingdom: Animalia, Phylum: Arthropoda, Subphylum: Crustacea, Class: Malacostraca, Order: Decapoda, Family: Atyidae, Genus: *Neocaridina*, Species: *Neocaridina davidi*.

Synonyms originating from the older nomenclature : *Neocaridina heteropoda*, *Neocaridina denticulata*, *Neocaridina sinensis* and *Caridina davidi.*

THE POSSIBILITIES OF USING HARVESTED RAINWATER

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Keywords: *rainwater, quality, bacteria, disinfection*

Discussed are the possibilities of using harvested rainwater for drinking and for other purposes on the basis of monitoring of its qualitative parameters. Physico-chemical and microbiological analyses were used to determine selected quality parameters of rainwater.

Samples of rainwater were collected at two locations in Bratislava and at 10 sites in Košice in autumn of 2019 and in summer and autumn of 2020. The physico-chemical analysis included determination pH, conductivity, ammonium ions, nitrites, nitrates, chlorides, phosphates, saturation with oxygen, iron, calcium, magnesium and consumption of oxygen by permanganate (COD_{Mn}). Microbiological analysis focused on counts of bacteria cultivated at 22 and 37°C (BC22, BC37), coliform bacteria (CB), *E. coli* a enterococci (EC).

The levels of individual parameters determined in rainwater were compared with limit values for drinking water specified by SR Government Regulation No. 247/2017 of the Code laying down requirements on water intended for human consumption and control of quality of water intended for human consumption. Our evaluation showed that harvested rainwater exceeded the limit value (LV) for concentration of ammonium ions at 1 sampling (1.1 compared to LV = 0.5 mg/l) and COD_{Mn}, the parameter indicating the level of organic matters, at 4 samplings. The limit for this parameter is 3,0 mg/l and the levels in samples that exceeded this limit were as follows: 3.52, 5.04, 5.59, 12.12 mg/l. Other observed parameters did not exceed the limits for drinking water. The pH ranged from 6.09 to 7.71 (SR Regulation range: 6.5–9.5). Conductivity ranged from 1.78 to 17.2 mS/m and thus failed to reach the range recommended for drinking water (25–50 mS/m. As the mineral salts pass to rainwater after it falls down, the contact with surfaces is a factor affecting their content. Conductivity of water may be reduced by demineralisation or reverse osmosis. Content of Ca^{2+}+ Mg^{2+} in rainwater ranged from 0.05 to 0.25 mmol/l, thus below the lower limit recommended for drinking water (SR Regulation range 11–5 mmol/l). Presence of these ions in drinking water is beneficial as it contributes to correct functioning of the cardiovascular system and supports detoxication abilities of the body. Deficiency of these elements assists to development of civilisation diseases and higher incidence of bone disorders (osteoporosis).

Results of microbial analysis showed presence of bacteria that indicate faecal contamination of rainwater. Limits for all monitored parameters were exceeded. Presence of coliform bacteria and *E. coli*, the direct indicator of contamination of samples with the content of digestive tract of warm-blooded animals was confirmed. The presence of these bacteria indicates insufficient protection of water source. Such water is not safe to drink and must be treated before its consumption. The treatment involves physical processes such as coagulation, filtration, sedimentation or radiation, and final disinfection is also required, most commonly by chlorination, UV light, ozonisation, microfiltration and ultrafiltration. The results obtained in this study indicate clearly that rainwater must be treated in order to achieve its microbiological safety before its use for drinking can be considered. Because the values of monitored parameters were not dependent on the time of sampling, treatment of rainwater should be adjusted according to the results of determination of the relevant parameters. For this purpose, it appears necessary to build interception systems for rainwater connected to filtration and disinfection units. The use of rainwater for drinking is one of the alternatives that may be considered in case of shortage of potable water. However, the harvested rainwater must be subjected to mechanical and physico-chemical treatment according to the level of important quality parameters.

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EVALUATION OF THE MICROBIAL LOAD OF THE BAKERY ENVIRONMENT

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Keywords: *disinfection, environment, Savo Original, Bakery operation, microbiological swabs*

Contamination of the environment plays a key role in the transmission of some pathogens that cause many types of infection. A range of pathogens are shed into the environment, can survive for long periods on surfaces, which can lead to widespread contamination. The most important means for maintaining effective microbial control is minimizing the microbial load, efficient control of growth at different surfaces and adequate cleaning and disinfection. Cleaning is a process of removal of microbial and non-microbial "dirt" from surfaces and disinfection is a process for killing of microbes on surfaces, via chemicals or by another processes. Disinfection is needful mainly in food processing plants, where wet surfaces provide suitable conditions for microbes. In the food industry, cleaning and disinfection is carried out in order to produce safe products with acceptable shelf life and quality and these processes should be performed as cost-effectively and safely as possible, in the shortest possible time, with low chemical. In this study we aimed on the efficiency of disinfection, using microbiological swabs before the start of production and after disinfection. Swabs were taken from different surfaces and technological equipment in the Production hall of the bakery operation. Commercial preparation Savo Original (3 % concentration) was used. Disinfectant was effective on wall, floor where were detected no bacteria after disinfection, but on the door and table were detected $1x10^2$ and $2x10^2$ per 10 cm^2 colony forming units of total count of bacteria and on the mixer were found $2x10^2$ colony forming units per 10 cm^2 of moulds after disinfection. By comparing status before production and after disinfection we can conclude that used disinfectant Savo Original was effective and sufficient for decreasing the number of colonies forming units after disinfection.

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IMPACT OF BROWNFIELDS ON THE QUALITY OF THE ENVIRONMENT

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Keywords: *environmental burdens, contamination, sustainable development*

Due to the development of an anthropogenic society, there is a constant expansion of built-up areas in undeveloped areas, which are gradually declining. At present, however, there are many urbanized areas that are abandoned, respectively. underused and in some cases contaminated and which are referred to as the so-called brownfields. Brownfields are currently understood as areas that may be accompanied by some form and degree of environmental burden, despite the fact that their definition is not uniform within the EU. Even in the territory of the Slovak Republic, the issue of solving brownfields is fragmented and their elimination has been concentrated primarily on calls aimed at supporting the development of industrial parks.
The article points out the determinants of the formation of such designated areas, t. j. brownfields, the different types of their categorization and describes in detail their negative effects on the environment of their occurrence and the quality of the environment. At the same time, it presents the basic differences in the definition of brownfields in selected countries, which directly determine the possibilities of their elimination in relation to the impacts on environmental quality, it means on quality of the environment and points to differences in the understanding of brownfields and environmental burdens, as these are marked by significant differences. In conclusion, the article presents practical examples of the elimination of brownfields accompanied by contamination in the Slovak Republic in interaction with the significant potential of their use in the field of support for further sustainable environmental development.

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CURRENT STATE OF SOLUTION OF ENVIRONMENTAL BURDEN IN THE CONDITIONS OF THE SLOVAK REPUBLIC

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Keywords: *environmental burdens, contamination, sustainable development*

At present, there is a large number of contaminated sites in the Slovak Republic, which are referred to as the so-called environmental burdens representing highly negative, barrier and risk elements determining the functional - spatial structure of the landscape and the development of environmental quality at the local, regional but also supraregional level. Due to the occurrence of environmental burdens, the state of the environment is accompanied by a decrease in environmental quality in all spheres of anthropogenic existence, as all anthropogenic activities in the area and its use are always reflected in the state of the affected area by its contamination by various types of pollutants determining some form of environmental damage. In some cases, these may be toxic non-degradable pollutants, resp. carcinogenic, mutagenic or teratogenic contaminants that can cause various diseases of a clinical or chronic nature. The growing cumulative causality of environmental problems understood in this way, or their synergistic effect of manifestations, also determines their degree of severity and complexity of the solution with the aim of increasing environmental quality in the context of further sustainable socio - economic regional development. It is for these reasons that the presented article is devoted to the occurrence of environmental burdens in individual regions of the Slovak Republic in interaction to point out regional disparities. Based on available relevant data, the article quantifies the index of change in the occurrence of environmental burdens in selected years in the Slovak Republic and their share in the Slovak regions and analyzes in detail the current state of environmental burdens according to the level of treatment in the register of environmental burdens, priority categories and types of activities determining their occurrence. Finally, it presents the potential impacts of environmental burdens on sustainable development, accepting its basic platform formed by the interaction links of the socio - economic and environmental spheres.

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ANTIBIOTICS IN THE SEWAGE SLUDGE – OCCURRENCE, FATE, POSSIBILITY OF REDUCTION: A PRESENT STATE

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Keywords: *sewage sludge, antibiotics, sewage sludge management*

The presence of antibiotics in raw and treated sewage, sewage sludge is an undeniable fact. Due to the water cycle in nature, this type of micropollutants have also been detected in drinking waters. Their impact on living organisms is also undeniable. Due to the low concentration of these compounds in environmental samples and the rich chemical diversity, it was difficult to develop a methodology for their determination. Currently, it is known that the samples taken for testing for the content of antibiotics should be especially prepared. The most commonly used, depending on the state of matter of the sample, different variations of centrifugation, filtration, extraction, e.g. SPE or MAE. Instrumental analysis of antibiotics is based on gas, liquid or high-performance liquid chromatography, most often correlated with tandem mass spectroscopy.
The other aspect is the development and implementation of a technology aimed at effective reduction of the content of these compounds in both sewage and sewage sludge. Due to the lack of legal regulations regarding the scope of the highest permissible concentrations of antibiotics in individual environmental samples, no practical technological solutions are introduced to remove these substances. Currently, due to the recording of increasing amounts and diversity of micropollutants in environmental samples, research is aimed at designing the most effective, comprehensive and optimal method that will not require the introduction of additional chemicals into the environment.
Currently, one of the most frequently used methods for the management of stabilized sewage sludge is its agricultural use, e.g. for soil reclamation or in the form of fertilizers. There remains the question of the fate of the antibiotics present in the sludge after contact with the soil.
This article will introduce and systematize the current state of knowledge on antibiotics widely used in the modern world. Aspects of research methodology, antibiotics content, the possibility of their reduction and the fate in the environment will be taken.

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WASTE MANAGEMENT IN THE CONTEXT OF THE EUROPEAN GREEN DEAL IMPLEMENTATION

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Keywords: *European Green Deal, circular economy, waste management, innovation*

The contemporary economic development of the European Union increasingly take into account environmental aspects. The economic development strategies developed in recent years have resulted in specific EU action plans and programs including environmental issues. These strategies assume that EU member countries meet many environmental standards that are in line with the applicable development concepts, such as sustainable development, circular economy, green growth or green economy. One of the newest concepts of this type is the European Green Deal. One of the key goals of this idea is the implementation of the circular economy model, which depends on a properly functioning waste management. The aim of the study is to present the determinants of waste management in EU countries against the background of expectations in this regard. These expectations concern the way of waste management, including increasing the levels of waste recycling while reducing their landfilling. Statistical information shows that waste management in the EU countries is more and more effective, but individual countries show significant differences in this area. One of the main factors supporting effective waste management is the development of modern, innovative technologies. The analysis shows the regularity according to which countries with a high level of innovation have high efficiency in waste management. In other words, countries with a low share of landfills in waste management have a high innovation rating, and vice versa. Thus, innovation can be considered as a factor supporting the implementation of the European Green Deal.

POTENTIAL OF THE CIRCULAR ECONOMY FOR THE EUROPEAN UNION CONSTRUCTION SECTOR

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Keywords: *circular economy, construction sector, European Green Deal*

CO_2 emissions from the energy sector will decline rapidly over the coming years, so material production is expected to be the biggest climate challenge in our economy. Energy-intensive industries are on the way to decarbonization, but their efforts are not enough yet. They are all somewhat committed to fighting climate change, some more than others, but their plans are heavily based on the carbon removal side, focusing on buying low-carbon feed stocks, green electricity and hydrogen.
The construction sector consumes a large amount of natural materials and produces a wide variety of wastes. This contributes to a scarcity of resources. Waste has a significant impact on the environment due to the growing needs of the world's population.
Recycling energy is the most common circular economy practice in the construction industry. Reusing concrete structures can help reduce a significant portion of the building's CO_2 emissions and make these measures economically efficient. The choice of building materials has a significant impact on the environment. This article shows the impact of building materials (cement, steel, glass, plastic) on the CO_2 emissions embodied in a building and compares it to some of the potential climatic benefits of a closed economy policy. It is proposed that circular economy interventions that are financially competitive, reduce the amount of green energy and materials needed to be efficient, and contribute appropriately not only to decarbonization, but also to other European objectives of the European Green Deal.

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RETENTION PARKING LOTS ON THE PRINCIPLE OF CIRCULAR ECONOMY

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Keywords: *retention, green infrastructure, recycled materials, circular economy*

The constant growth of the population living in an urban way of life is causing greater demand for the construction of residential and industrial complexes. These complexes usually solve only the primary task and do not address the impacts of the construction on the landscape and the population by appropriate design of the elements of green infrastructure. Retention parking lots are also among the elements of the green infrastructure. In applied research we will have determined values of the retention volume, determination of the runoff time, runoff coefficient, statics and dynamics of the composition in the dry and saturated state. These data will be used by professionally qualified persons in the design of retention parking lots, whose other added value is the use of recycled materials in the system of retention parking lots. The solutions in question thus fulfil the principles of the circular economy, slow down the outflow of rainwater from the area of interest and contribute favorably to the cooling of the microclimate in the area.

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MUNICIPAL WASTE IN SLOVAKIA AS A POTENTIAL FOR THE CIRCULAR ECONOMY

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Keywords: *communal waste, circular economy, sustainability*

If we talk about municipal waste in connection with circular economy, each European produces about 500 kg of waste per year. Less than half of it is 46% recycled, 27% is incinerated and 24% is landfilled. However, if we talk about the Slovak Republic, in 2019 1 person produced an average of 421 kg of waste per year, and this indicator has a significantly rising character. For comparison, in 2001 it was 239 kg of waste / person / year and compared to 2018 it is an increase of 7 kg / person / year, compared to 2017 up of 43 kg / person / year. Municipal waste is an interesting indicator of the circular economy, as a new trend, an economic approach, the main goal of which is to create a world without waste. However, this is of course not possible and therefore it is necessary to approach waste on the one hand in the intentions of waste management, ie in particular to try to prevent it or subsequent proper treatment. It is in this context that the waste recycling rate is an interesting indicator with regard to circular economy. Speaking of the EU as a whole, waste recycling is 46.9%. In Slovakia, the level of waste recycling is only 38.5%. However, the big positive is that this indicator has an upward trend. Among the absolute leaders in the EU in recycling are countries such as Germany, Belgium, Switzerland, Austria. At the same time, the biggest leaders in the introduction of the circular economy are countries such as the Netherlands, Sweden, Finland, France and Slovenia. Despite the binding goal of limiting landfilling to a maximum of 10% of municipal waste by 2035, as well as relatively strict provisions in the Waste Act, landfilling remains the most widespread method of waste management in Slovakia. The absolute leaders in the lowest landfill in EU countries are Sweden, Finland and Denmark, which have a landfill level of less than 1%.

A similar analysis of municipal waste generation in selected EU countries was carried out in 2019, with the aim of identifying the potential for residual municipal waste generation, taking into account historical data, EU targets and existing residual waste treatment capacities. The result of this assessment for the Slovak Republic was that from 2025 there will be a lack of processing capacity for non-recyclable waste at the level of 600 to 700,000 tons of municipal waste (assuming that the current processing facilities with a capacity of about 300,000 tons per year will remain operational). Taking into account the current capacity of waste-to-energy facilities, this opens up recovery potential for a further 900,000 tonnes of non-recyclable municipal waste in the future.

In view of the above facts, the article discusses the situation in Slovakia, which will need to be resolved and taken into account in connection with the production of municipal waste and the effort to comply with European goals of the circular economy. Especially if we are considering in the light of the current global crisis caused by the COVID - 19 pandemic and more and more produced non - recyclable waste.

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SUPPORT OF THE CIRCULAR ECONOMY BY THE SLOVAK REPUBLIC

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Keywords: *circular economy, sustainability, Slovakia, strategic documents*

Although the concept of the circular economy as a term is first mentioned since 2015, when the "Action Plan for the circular economy" was adopted at European level, it is still not possible to speak of a sufficient knowledge base in this area. It is the Action Plan (COM (2015) 614) that can be seen as an initial strategic document that sets out a concrete and ambitious roadmap for implementing the Sustainable Development Agenda 2030. However, the European Green Agreement cannot be left out in this context either (COM(2019) 640). It is seen as a new growth strategy to transform the EU into a fair and prosperous society with a modern and competitive, resource-efficient economy, with net greenhouse gas emissions expected to be zero by 2050 and economic growth independent of resource use. A new EU circular economy action plan - Towards a cleaner and more competitive Europe was also adopted in 2020 (COM(2020) 98). The main priority areas are measures focusing on the value chains of key products electronics and ICT (information and communication technologies), batteries and vehicles, plastics, textiles, packaging, construction and buildings, food, water and nutrients measures covering all links in the value chain from production to consumption , repair and refurbishment, waste management up to the return of raw materials back to the economy and their use in the production cycle in the form of secondary raw materials. The transition to a circular economy also includes a revision of the European waste directives: on waste, on packaging and packaging waste, on landfills, on batteries and accumulators and used batteries and accumulators, and on waste electrical and electronic equipment.

In this context, Slovakia, as a member of the EU, also had to take many measures, and the new programming period brought a number of changes in this area and related areas. The ambition of the Slovak Republic to switch to a circular economy is enshrined in the Program Statement of the Government of the Slovak Republic and in strategic documents. The Waste Management Program of the Slovak Republic for the years 2021 - 2025 was adopted, which contains goals and measures focused on green and circular management, e.g. ensure at least 70% of the total value of public procurement by green public procurement by 2030; increase support for green innovation, science and research; ban the disposal of food waste for supermarkets. In addition, however, the Government Council for the European Green Agreement was established, the Slovak Environment Agency operates and manages the Green Economy information platform, and voluntary environmental policy instruments and their implementation are increasingly coming to the fore. The project "Preparing a Roadmap for the Circulating Economy" has been running since 2020 and what awaits us as a country in this context, what goals we have committed ourselves to meet and which government documents currently address the circular economy and the extent to which it discusses the contribution.

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SELECTED INNOVATION TOOLS IN DESIGNING PROCESS MANAGEMENT

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Keywords: *innovation tools, cluster structure, procedural management, project management, system integration*

This contribution deals with the specification of the current immunity of strategy and status and level of procedural management in special organizational structures referred to as industrial clusters. It represents selected specifics of the design and application of innovative tools, system integration, and agile project management of clusters. It describes and explains the context between the strategy, the organizational structure, and the need for project procedural management at the current position and competitiveness of clusters on the market in demanding energy and environmental conditions. In the end, it shall submit its own author's design scheme for a new organizational project aimed at a cluster structure and draft management process and coordination of clustered projects for their clients.

Management of projects specializing in industry, construction, manufacturing, and especially energy and ecology in large and international companies and holdings is a common phenomenon, but in cluster groups and their companies (members) that deal with the project, the most common differences are the so-called. "Mega-enterprises" in one-off creative activity (in the case of a project designed for their own needs) or in short-term, recurring, or overlapping activities (in the case of management service for customer projects). Characteristic of such a situation is that the projects have a shorter implementation time of 3 months to 1 year; reasonable financial volumes and costs for the project with lump sums; a small number of universally skilled people in teams; precise and specific work plan and timetables; cluster managers are often also project managers and project teams work in daily contact; the processing of project tasks and tasks usually takes place individually and manually; communication channels are shorter, decision-making is fast, team members get to know each other sooner and in more detail, motivational factors are more flexible and targeted estimates and studies (ideas) of projects, which are the basis for planning, are much more accurate and simpler, as it is possible to better know specific conditions and the overall history and needs of the customer and which project. However, this advantage and relative simplicity is also a possible source of some problems that can arise in the process management/project management of the cluster, namely: conflicts of interest and priorities for project managers and the team leader, as well as the lack of affordable specialists and alternative alternatives in the project; even if the specialist is deployed, the scope of the project will not allow him to fully deploy; it is often partially redundant, time-consuming and costly and inefficient; greater sensitivity of the cluster and project team members to conflicts and risks, or disagreements in the professional approach to the content of projects and at the same time paradoxical informal relationships can be an obstacle in the work discipline; possible delays or shortcomings in any of the managed projects may have a negative impact on other projects (consistency, coherence, etc.). The author of this article perceives clusters as a modern and successful tool for innovation and strengthening the competitiveness of Slovakia, and for a long time, he has been dealing with the subject of the paper in the context of extensive research and publishing activities.

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IMPACT OF INNOVATIONS ON THE SAVING OF THE PRODUCTION COMPANY'S WORKING TIME FUND

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Keywords: *Innovation, saving time, critical points of the production process*

Manufacturing innovation is currently a key determinant of the development of any manufacturing company, which also directly affects its competitiveness in a constantly changing market conditions. The main reason for introducing innovations in production is the reaction of manufacturing companies to the changes caused by the competitive market environment. The primary goal of implementing innovations into production processes is to increase sales to customers, ensure production quality and, of course, productivity, respectively. business efficiency. The mentioned facts will be further reflected in the very philosophy of the production company and its brand, with which it can maintain, resp. increase their competitiveness and market position. The presented article deals with innovation management in the conditions of a manufacturing company, the aim of which is to reduce the working time fund directly determining productivity, resp. efficiency of the company in competitive market conditions. Based on the explicit quantification of time frames based on the analysis - chronometry method relating in part to the operations of the production process, the article presents the results of observation, time measurement, examination and evaluation of time consumption in the implementation of repeated production operations, respectively. Its complex part within the defined production workplace. Based on explicitly performed quantitative analyzes of the introduction of innovative technology consisting in the use of the latest information and communication technologies determining the time consumption of partial production operations, the article presents an innovative solution in production technology management that supports sustainable development with emphasis on environmental quality development. Finally, it presents an explicit quantification of the working time fund savings by implementing innovative mechanical engineering equipment in critical production operations of the analyzed production process.

HEALTH BELIEF MODEL AS A MARKETING TOOL AND ITS PERSPECTIVE IN THE CONTEXT OF FUTURE NEUROMARKETING RESEARCH

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Keywords: *social marketing, neuromarketing, marketing tool, behavioral model, business behavior*

Social marketing first emerged in the 1960s, introduced by Kotler and Levy. In their article "Broadening the concept of marketing", marketers were invited to consider whether marketing principles could be transferred to the marketing of organization, ideas, and persons. Two years later, social marketing was formally conceptualized by Kotler and Zaltman. According to Saunders et al. (2015), social marketing is a practice that uses marketing principles to influence target audience behaviors for improving individual and social well-being and the physical, social and economic environment in which they live. Social marketing promotes good behavior using marketing techniques such as formative research, branding, segmentation, and the marketing mix. Since 1980, social marketing has been playing a pivotal role in injury prevention, environmental protection, community mobilization and health promotion. In the attempt to change behaviors, social marketing has used various behavioral models and theories where we can include Health Belief Model (HBM) that has been used to address social issues. In our integrative review, we explore the HBM and its objective in the context of health behavior and its potential employment, perspective, utilization in neuromarketing research.

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DEVELOPING THE IDEA OF SMART CITY ON THE EXAMPLE OF CITY OF RZESZOW

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Keywords: *smart city, place marketing, promotion of Rzeszow*

Over the years numerous concepts of urban development and city government have been flourished. The idea of smart cities is among the most popular both for metropolises and smaller cities. This paper discusses a smart city initiative being led by Rzeszow, a city located in the south-eastern Poland. It presents various ways of defining the concept of smart city, as well as examples of good practices in smart cities. The solutions implemented by Rzeszow in order to gain a status of a smart city are compared to ideas used by other Polish cities that are classified in international rankings and reports, especially in IESE Cities in Motion Index.
Rzeszow aims to create its image as an innovative and smart city and to achieve this aim it undertakes various activities, including promotional ones. The main purpose of the study is to present how inhabitants of the city perceive and assess solutions undertaken by Rzeszow as a smart city and to what extent they are familiar with city's initiatives. The main hypothesis adopted in the study assumed that the inhabitants of the city were aware only of the most visible initiatives implemented by the city, such as Intelligent Transport System and they were not able to indicate many components of a smart city.
This study contributes by presenting a case study of a Rzeszow city from two perspectives – the city authorities who seek to improve the quality of life by undertaking various smart city initiatives and inhabitants of the city who are the recipients and main beneficiaries of the introduced changes.

PYROLYSIS OF PLASTIC WASTE FOR TRANSPORTATION FUEL PRODUCTION

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Keywords: *plastic, plastic waste, hydrotreatment, pyrolysis, fuel*

In the present day, the growing utilization of plastics generates increasing amount of usually landfilled waste. Recycling of plastic waste is desirable to lower the environmental pollution and fulfil the requirements of circular economy. Energetic utilization is another possibility, however, municipal solid waste containing plastics is usually combusted to generate heat and electricity. An attractive way of dealing with the plastic waste is pyrolysis, which has the potential of producing liquid hydrocarbons suitable as transportation fuel. The pyrolysis results of three plastics produced in the largest amount globally, namely polyethylene, polypropylene and polystyrene and their mixtures are presented. The experiments were performed in a laboratory scale batch reactor. The resulting oils were separated by distillation to provide gasoline and diesel like (distillation cuts at 210 and 350 °C) hydrocarbons. The gasoline fractions were further analysed by GC-MS and compared with EU gasoline standard with respect to the oil composition. It was found that the oils from PE, PP and PS all contain compounds present in standard gasoline. Mixing PS with PE and PP before the pyrolysis, or the oils afterward produces much closer results to standard requirements as PS pyrolysis generate mostly aromatic content. As standard maximizes the olefin content of gasoline to 18 Vol%, hydrogenation was also performed using Pd based catalyst. The hydrogenation process significantly reduced the number of double bonds resulting low olefin content. Results show that the pyrolysis of plastic waste mixtures containing PE, PP and PS is a viable method to produce pyrolysis oil suitable for gasoline-like fuel extraction and further hydrogenation of the product can provide gasoline fuels with low olefin content.

SCARCITY OF BATTERY-RELATED MINERALS PRICE ANALYSIS

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Keywords: *energy, GARCH, renewable energy sources*

Energy is an important impetus behind the socioeconomic development of society. The ability to freely obtain and use energy is a strategic element of state security policy. In the light of the significant use of traditional energy carriers and the dynamics of the development of renewable energy sources (RES), ongoing verification of supply security of critical for RES minerals is significant. Thus, price analysis is highly required. Therefore, the aim of this study is to examine the supply security in terms of price conditions for battery-related minerals. It should be noted that this kind of research is essential and up-to-date due to the fact that energy storage and batteries are fundamental for current and future energy security. Hence, this article contains price-volatility analysis using ARCH and GARCH models for major battery-related minerals, like Manganese, Cobalt, Copper, Lithium, Silicon, Nickel or Dysprosium. In contrast to the existing research mostly focusing on price stability of energy commodities, a price volatility analysis for minerals for RES (battery-related minerals) is proposed. The results finally allows to conclude about the energy security of the future.

USAGE OF UAV IN POWER INDUSTRY

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Keywords: *UAV, Power, Industry*

The use of UAVs in various areas of life and industry is increasing. They find more and more applications and create more and more possibilities. This paper presents possible applications of UAVs in the energy sector. Based on the analysis of scientific and popular science articles, as well as industry magazines, various most popular applications were selected, such as flue gas quality control, testing of cooling towers, testing of power plant buildings, auditing and extension of transmission lines, control of wind and solar farms. Technologies used in UAVs are also presented, which enable the implementation of the above-mentioned objectives, such as e.g. multispectral cameras, thermal imagers, air quality analyzers, GPS antennas, accelerometric and barometric sensors. Methods with the use of UAVs enable cheaper and safer inspections of energy installations as well as power plants and renewable energy farms.

GEOTOURISM AS AN OPPORTUNITY TO REDUCE MASS TOURISM IN A POSITIVE WAY

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Keywords: *geotourism, mass attendance, mainstream tourism, sustainable tourism, zoning area*

Recently, the seasonality in tourism has been strictly influenced by waves of covid 19. Thus, it turns out that especially the seasons, whether summer or winter may continue to shorten. Which results in a huge increase in attendance during short periods of time. Thus, there is a mass tourism, which also arises in such destinations, which did not know it in the past years. The presented work deals with the creation and search of opportunities for the development of geotourism as another form of tourism to mainstream tourism. The aim of the work is based on a case study of the evaluation of the studied area to provide opportunities to release the tourist mass from attractive and well-known locations. Another significance of the presented work is the provision of proposals in the field of geotourism, how to use lesser-known localities so that they are an attraction for tourists from mainstream tourism. The work is beneficial because it shows the possibilities of how to divert visitors from mass destinations in a positive way and thus make tourism more sustainable.

INNOVATIVE TECHNOLOGIES AS A MOTIVATIONAL TOOL FOR ACTIVE TOURISM

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Keywords: *innovation technologies, tourism, physical activities, motivation young people*

The submitted paper focuses on the analysis of innovative technologies and their use in the realization of tourism, as one of the most wide-spread physical activities. Tourism connects the effect of physical activity with the process of getting to know the attractive environment that is nature. Today, there is an increase in the requirements of tourists for innovative technologies, which elucidate the character of visited places, help with orientation and safety in terrain. In the next part it brings an overview about the innovative technologies focused on tracking physical activity. It provides information on the innovative technologies that focus on safety, calling help and an integrated emergency system in place. It indicates the usability and benefits of said innovative technologies.

UPGRADING AND MECHANICAL ACTIVATION OF HUNGARIAN LIGNITE TYPE FLY ASH

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Keywords: *fly ash, material properties, mechanical activation, planetary mill*

As a result of the continuous technological development, the need for various raw materials in high quantities is a necessity. However, in many application fields, the replacement of primary raw materials can be a viable option, for example fly ash is used as soil amendment or mine backfilling material, for cement or geopolymer production etc. Thus, fly ash can be considered as a secondary raw material instead of an industrial waste or by-product to be deposited. In order to improve the properties for further utilisation, the processing of fly ash is essential, and various types of mills can be used to grind and mechanically activate fly ash.
Due to the composition of the fly ash used during the experiments, upgrading via sieving was applied before mechanical activation to achieve a higher overall concentration of reactive compounds for possible future applications, and to decrease the amount of contaminants in the sample. The mechanical activation was carried out in a planetary ball mill, for 5, 10, 20, 30, 60 and 120 minutes.
The examination of the material properties, such as particle size, surface area, microstructure, etc., of the base material and the ground products revealed the efficiency and the optimal time of the mechanical activation.

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THE POTENTIAL OF WASTE MANAGEMENT AS A SOURCE OF RAW MATERIALS AND ENERGY IN INDUSTRY

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Keywords: *environment, waste to energy, circular economy, raw materials, fossil fuels*

Slovak waste management will undergo a transformation in the coming years due to legislative conditions, stricter European standards of waste management and, last but not least, the commitment of Slovakia as the country with one of the highest landfill shares in the EU. According to data from the Statistical Office of the Slovak Republic, in 2020 a total of 2,434,040 tons of municipal waste was produced in Slovakia, what is 2.71% more than in 2019. The total amount of materially recovered waste in Slovakia was at the level of 586,088 tons, which represents 24%, and the recovery of organic matters recovered 476,847 tons, which is almost 20%. In total, we can consider this to be a recycling rate of almost 44%.
Energy recovery increased in 2020 to 187,795 tonnes, a share of only almost 8%. Landfilling still remains the worst way of disposing of waste. In 2020, up to 1,177,944 tons were disposed of in this way, which represented more than 48% of municipal waste management in Slovakia. However, you can see a trend of reducing this type of municipal waste management, as in 2019 almost 51% of municipal waste was treated in this way. According to the waste management hierarchy, the most appropriate forms of waste management should be followed by energy recovery and incineration, and only subsequently as the least acceptable landfill. Among the most significant shifts in reducing the share of landfills has been achieved in the EU and in 2 cities in the Slovak Republic, where there is a facility for energy recovery of waste, this trend is noticeable everywhere in Europe and also in Slovakia. For example, according to available data, Košice landfills only 1% of its municipal waste. In November 2021, Slovakia adopted the long-awaited Waste Management Program of the Slovak Republic for 2021-2025, where the most positive shifts include priorities in the construction of BIO waste treatment facilities, continuation of targeted waste separation at source and, last but not least, support for the construction of existing energy facilities for waste recovery and construction of new ones. The Trnavský, Nitriansky, Žilinský and Trenčiansky regions are among the regions with the greatest potential for reducing landfilling, increasing recycling and energy recovery. Until 2035, the Slovak Republic has a historic role to play in compensating for the shortcomings of waste management. Given the availability of BAT (best available techniques), it can fulfill the ecological form of waste management (commitment to reduce landfilling below 10%), which may result in conservation of natural resources (increasing recycling above 65%), replacement of fossil fuels (recovery of waste in the form of solid secondary fuels) in heating plants and power plants and by reducing the production of CO2 and CH4 as greenhouse gases in which waste management has a significant share. All this can be achieved by respecting the principles of circular economy, rational and economic approach.

ELEMENTAL ANALYSIS OF CONTAMINATED BIOMASS ASHES FOR PHYTOMINING OF RARE EARTH ELEMENTS

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Keywords: *brownfields, phytoextraction, rare earth metals, recovery, chemical analysis*

Phytomining of rare earth elements (REEs) provides a potential possibility for metal recovery at brownfields where conventional mining technique is not reasonable or profitable. The holistic concept of phytomining is instituted from three scientific sectors. Phytoextraction is the first stage referred to accumulation of REEs in plants. This is followed by the enrichment process aiming to elevate metal concentration into solid remains. Eventually, extraction technology is applied to reclaim these valuable metals from the bio-ores. The main goal of this study is to identify a possible location for REEs phytomining, which lays the groundwork for further investigations. To do that, different woody biomass from disparate contaminated spots was harvested and examined. A brownfield land located in Gyöngyösoroszi, Hungary has been selected based on the elemental analysis of ash samples obtained from the incineration of the collected plants at 500°C. The outcomes also preliminarily indicate the viability of phytomining in recovering REEs.

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THE EFFICIENCY OF LOGISTICAL PROCESSES – THE ECONOMIC ASPECT BASED ON THE EXAMPLE OF ENTERPRISES LOCATED IN POLAND

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Keywords: *the economic performance, management of logistical processes, logistics in production companies*

The main purpose of my speech is to present the issue of the economic performance of logistics processes and the results of my own research on their calculation in manufacturing companies. The results presented in my presentation are a part of a broader study, also including: conditions for controlling logistics processes and measures of costs in the assessment of logistics processes in Polish manufacturing companies. The undertaken research issues and the set goal determined the choice of research methods, such as: review of critical literature, questionnaire research in Polish manufacturing companies, methods of analysis and synthesis. A reliable and reliable system for measuring the economic efficiency of logistics processes of production companies located in Poland and the valuation of individual types of resources is undoubtedly a condition for the success of the company's policy. The most important conclusions include the fact that for each type of resource (logistic infrastructure, material and financial resources and human capital) there is a significant dependence of its valuation depending on the calculation of the economic efficiency of logistics processes. The results can be used to develop a long-term development strategy for Polish and foreign manufacturing companies.

PRODUCT QUALITY MANAGEMENT TAKING INTO ACCOUNT THE CONCEPT OF SUSTAINABLE DEVELOPMENT

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Keywords: *quality management, quality engineering, sustainability*

Abstract: Currently, companies, in order to remain competitive, are forced to adapt their management methods to trends determined by changing environmental conditions. However, due to the significant pace of change, this is an extremely difficult task. Manufacturing companies often adapt available concepts and imply various standards, as market success is increasingly influenced by skilful following of trends (such as e. g. responsible consumption, services within the economy or co-creation of a zero-carbon strategy). The current versions of ISO standards concerning quality and environmental management as well as the approach related to sustainable marketing take into account customers' expectations concerning the appropriate quality of products, paying attention to ensuring an appropriate level of environmental protection with integration of sustainable development issues into the organisation's activities. This approach to thinking about product quality assurance and viewing management in environmental and social terms means that the standards bring companies closer to the idea of sustainability. The aim of the study was to analyze the standards related to quality and environmental management and sustainable marketing in relation to the possibility of implementing the idea of sustainable development in organizations. An element of novelty is highlighting the links between activities related to ensuring the expected level of quality of products and taking care of reasonable management of available resources. The study is a useful material for entrepreneurs who want to produce good quality products in accordance with the idea of sustainability.

STANDARDIZATION CHALLENGES FACING POLAND AND GEORGIA IN TERMS OF SUSTAINABLE DEVELOPMENT

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Keywords: *International Organization for Standardization, discussing Poland and Georgia, ISO, sustainable development*

The purpose of our article is to define the role of Introducting and establishing ISO practices and how it affects Poland and Georgia in terms of reaching sustainable development goals. Moreover, the authors are going to define the importance of International Organization for Standardization throughout Poland and Georgia. The elaboration is to answer the questions: 1) how the existing situation of both countries influences sustainable development goals, 2) what is the main reason of unpopularity of ISO in Georgia contrary to Poland and what impact does it have on the country's development? In the introductory part of the article we are ecplaining the existing situation in terms of introduction of ISO proecological standards in both countries. The research methodology will be discussed and the literature on the issue will be reviewed, then the situation of Poland and Georgia in terms of working on sustainable development goals will be compared. In the last part we will present the recommendations that should be taken into consideration in case of improving the process of sustainable development by implementing ISO standards in Poland and Georgia.

COMPARISON OF ALTERNATIVE METHODS OF THE TANK WAGON VOLUME DETERMINATION

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Keywords: *water savings, railway tank, computer modelling, 3D scanning, volumetric method*

Tank wagons are used to transport gaseous and liquid substances. Until now, the volumetric method of filling water and simultaneously measuring its volume with flow meters has been used in many production plants to control the volume of the tank, which is a method requiring a special workplace with powerful pumps. During the measurement, there is a large consumption of water, which is contaminated with impurities from production after the measurement and it is necessary to ensure waste management for it. Electricity is used to drive the pumps during filling and draining and also to dry the tank after measurement. In recent years, an alternative optical scanning procedure has been used to reduce the environmental burden.

The article is focused on the effectiveness comparison of testing the dimensional parameters of a railway tank wagon with internal ribbing. One of the used methods widely used in production plants is the traditional volumetric method, i.e. measuring the volume of water when filling the vessel using flowmeters. The alternative method uses a computer processing of data obtained by 3D scanning of the tank interior from several positions and the subsequent calculations on the tank model including its volume using the PolyWorks software. Evaluation of both measurement methods revealed that both methods are sufficiently accurate, and despite the non-trivial internal division of the measured object, even in this case the scanning method provides the measurement result several times faster as compared to the volumetric method. In the reported example, measurement time spent to achieve results for the scanning method was approximately one third compared with that of the water filling. In addition, the scanning can be performed without special requirements for the workplace equipment.

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CONCEPT OF MODEL PREDICTION PRODUCT QUALITY CONSIDERING SUSTAINABILITY DEVELOPMENT CRITERIA

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Keywords: *prediction; decision support; quality; sustainability development; mechanical engineering*

Supporting decision of product quality conditioned a need to crate decision models. It is important to create this model based on key sustainability criteria, so criteria which are expected by customers and environmentally friendly. These models should allow prediction of the best alternatives of criteria. It results from dynamic changes of the market and a fuzzy decision environment. In this view, it was identified a lack of a coherent model to predict quality considering social and sustainability criteria. These criteria should include basic aspects of usability and satisfaction with product (i.e. technical and qualitative criteria), and environmental and landscape criteria. The mentioned landscape criteria condition a change of product quality depending on localization of product, hence their inclusion is still problematic. Therefore, the purpose was to develop a model to predict products' quality considering society-ecological criteria, and which will support sustainable development of products. A novelty has proposed the model, in which to prediction of quality considering not only technical criteria but also ecological and society (landscape aesthetics) criteria. As part of model verification, photovoltaic panels were analyzed.

ULTRASONOGRAPHIC STUDY: MEASUREMENT OF KIDNEYS SIZE IN DOGS

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Keywords: *kidney, ratio ,K/L5, ratio K/Ao, bull terier*

The aim of our work was to measurement the kidneys of dogs with a pedigree of breeds Bull Terrier (n=9), Staffordshire Bull Terrier (n=4) and American Staffordshire (n=4) . We performed longitudinal measurements of kidney size and correlated with width of aorta and lengths of the fifth lumbal vertebrae, also measurement by ultrasound.
In our work, we also determined the average the ratio of the longitudinal length of the kidney (K) to the aorta (Ao) and to the lumbar vertebra (L5) for each breeds, where we found an average K / Ao ratio of 7.03 and K / L5 2.26 for the Bull Terrier breed.
For the Staffordshire Bull Terrier breed, we found the value of the average K / Ao ratio of 5.82 and K / L5 1.98. We found average values for the American Staffordshire Terrier breed K / A ratio 6.14 and K / L5 2.22. Rrenal cortex was similar in thickness to all selected breeds: 0.6 cm for breeds American Staffordshire Terrier and Staffordshire Bull Terrier and 0.63 cm for the Bull Terrier breed.

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THE EFFECT OF IVERMECTIN ON SPIKE PROTEIN AND ACE-2 RECEPTOR BINDING

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Keywords: *SARS-CoV-2, Spike protein*

COVID-19 first appeared in a seafood market in Wuhan, China, in late December 2019, and was declared a public health emergency by the World Health Organization (WHO) a few weeks later. This infectious disease is caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). On a cellular level, SARS-CoV-2 uses the Spike protein (S protein) to facilitate entrance into the host cell. This protein has two functional domains: an S1 receptor-binding domain (RBD) and a second S2 domain that enables membrane fusion between the virus and the host cell. The SARS-CoV-2 S protein connects to the host cell's ACE-2 receptor via the S1 receptor binding domain.

COVID-19 therapy is characterized by the fact that there is not yet a sufficiently effective causal treatment, so pharmacological treatment focuses against symptomatic infection. In addition to the development of new drugs, attention has turned to so-called repurposed drugs - already approved drugs with antiviral activities, showing inhibitory effect against SARS-CoV-2 as well. These medications are accessible and their safety and toxicity profiles are well documented. Contrarily, the efficacy and clinical doses required for treatment in patients with confirmed COVID-19 are unknown and their mechanism of action against the virus is often speculative as a result of a lack of substantial clinical studies.

Nobel Prize-winning Ivermectin, which is also on the World Health Organization's Model List of Essential Medicines, is one of these drugs. In addition to Ivermectin's antiparasitical, antimicrobial and antiviral properties, studies have showed that Ivermectin interacts with the host nuclear import/transport proteins importin-α and importin-β and therefore inhibits SARS-CoV-2 nuclear transport. Although the detailed mechanism of action of Ivermectin on SARS-CoV-2 virus is not fully known, some *in silico* studies suggested the possible inhibitory effect against SARS-CoV-2 virus and ACE-2 receptor.

Our experiments studied impact of Ivermectin on the binding capacity of labelled S protein (PE) to the ACE-2. As *in vitro* model, we chose HEK293T cells with ACE-2 receptor expression. Ivermectin (Galmectin, Pharmagal) at concentrations of 12.5; 31.25; 62.5; 125; 250 µmol was pre-incubated with S protein at 100; 250; 500; 1000; 2000 ng/ml concentrations for 30 minutes. Following that, the mixture was incubated for 2 hours with HEK 293T cells. As a negative control we used S protein at the given concentrations without blocking agent. Data were obtained by flow cytometry (BD FACS DivaTM). Our results show that Ivermectin significantly inhibited the binding capacity of S protein at lower concentrations tested (11.62 % for 100 ng/ml concentration of S protein; 32.82 % for 250 ng/ml; 30.88 % for 500 ng/ml; 46.97 % for 1000 ng/ml and 59.83 % for 2000 ng/ml) compared with negative control (29.13 % for 100 ng/ml concentration of S protein; 40.65 % for 250 ng/ml; 45.16 % for 500 ng/ml; 58.32 % for 1000 ng/ml and 59.,93 % for 2000 ng/ml). The toxicity of Ivermectin to cells at these concentrations will be the subject of next research. Nonetheless, after detailed investigation and validated controlled clinical trials, Ivermectin could become part of prophylactic as well as early COVID-19 therapy.

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MESENCHYMAL STEM CELL DERIVED CONDITIONED MEDIA IMPROVE NEURITE OUTGROWTH OF NEURAL PROGENITOR CELLS

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Keywords: *mesenchymal stem cells, adipose tissue, umbilical cord, neural progenitor cells*

Neurodegenerative diseases are common problem for companion animals. Due to the limited ability of injured axons to regenerate, innovative therapies combined with rehabilitation have been applied and evaluated. Among them, stem cells and their conditioned media implantation which can ameliorate damaged tissue has been suggested as a promising treatment strategy. The main goal of our study was to characterize MSC derived from canine adipose tissue (ATMSC) and umbilical cord (UCMSC) and analyse effect of their conditioned media (CM) on neurite outgrowth of neural progenitor cells (NPCs) isolated from the brain cortex of neonatal rats. MSC from both sources showed high osteogenic and chondrogenic potential and expression of CD90 (65% in average) and CD29 (96% in average). Furthermore, both UCMSC-CM and ATMSC-CM stimulated neurite growth. Interestingly, this effect was more pronounced with UCMSC-CM when compared to ATMSC-CM *in vitro*, which may be related to the different content of neurotrophic factors included in the CM.

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HAEMATOLOGICAL STATUS OF SELECTED BREEDS OF PIGS IN ORGANIC AND CONVENTIONAL BREEDING

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Keywords: *Yorkshire, Mangalitsa, haematological parameters, welfare, conventional breeding*

Haematological parameters were determined in Yorkshire pigs under conventional breeding conditions and Mangalitsa breeds in organic breeding. In this work we focused on haematological parameters of selected breeds of pigs, on quantitative evaluation of leukocytes (WBC), erythrocytes (RBC), hemoglobin (Hgb), haematocrit (Hct), platelets (Plt) in Yorkshire and Mangalitsa breeds in commercial and ecological conditions with regard to selected seasons. The paper presents and compares the obtained values of haematological parameters in the blood of pigs breeds Yorkshire and Mangalitsa, their statistical evaluation and analysis of differences in individual parameters in terms of breeding and the impact of the spring and autumn seasons. Comparing selected haematological parameters in Yorkshire and Mangalitsa pigs in the spring, we found that the average values of WBC and Plt were higher in Yorkshire than in Mangalitsa, all other monitored parameters RBC, Hgb, Hct were higher in Mangalitsa. When comparing the values of selected haematological parameters between the Yorkshire and Mangalitsa breeds, statistically significant differences ($p < 0.001$) were found in the autumn sampling in the RBC, Hgb and Hct parameters. WBC and Plt did not show statistically significant differences.

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IMPACT OF CARCASS DISPOSAL ON WATER SUPPLIES

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Keywords: *animal, burial, environment, legislation*

Various disposal methods like burying, burning, incineration, rendering and composting are used around the world, depending on the legislation in each country. These methods raise some environmental, biosecurity, social, and economic concerns. Although animal carcasses are buried beneath the soil surface and thus no longer visible, they continue to pose a threat to the environment. The risks associated with carcass burial are numerous and have been linked to a variety of potential threats such as nutrient, pathogen, antibiotic, and other chemical transmission to the environment. The burial of dead animals may result in pathogen propagation and subsequent pollution of groundwater and drinking water. Incineration is costly and has the potential to pollute the air. Cost of transportation and limitations on the movement of infected animals from one location to another are also subject to certain constraints. Water resources are frequently the most vulnerable aspect of the environment, depending on the disposal method. Disposal sites may be located near waterways, lakes, and ponds, and there seems to be a chance that groundwater exists beneath them. Those can become contaminated as a result of carcass disposal and represent as a route or delivery medium for waterborne pathogens and carcass liquids. To reduce environmental impacts on surface water, groundwater, soil, and air, carcass disposal should be handled properly.

Disease outbreaks may also have a negative impact on the environment not only in terms of disposal issues, but also in terms of biodiversity. Disease outbreaks can result in an unanticipated large number of dead livestock, posing a disposal challenge. Mass burial of carcasses poses significantly greater environmental and biosecurity risks than routine mortalities burial, because pathogens existing in carcasses can pose even higher environmental dangers. Different factors such as soil characteristic, permeability, groundwater level, and amount of rain all have a significant impact on pathogen movement from disposed carcass to groundwater, so dealing with carcass disposal, quick and effective responses are required.

The disposal of all animal by-products is not a viable option because it would result in unsustainable costs and environmental risks. Livestock burial is prohibited in the EU due to concerns that infectious agents may inadvertently enter both the human food and animal feed chains, causing pollution. Some people are concerned that improper burial could contaminate ground and surface water with pathogens and chemical by-products of decomposition. Burial and burning of animal by-products, particularly dead animals, may be justified in certain circumstances, particularly in remote areas, or in disease control situations necessitating the immediate disposal of animals killed as a measure to control an outbreak of a serious transmissible disease. Disposal on-site should be permitted only in exceptional circumstances, because available rendering or incinerator capacity within a region or a Member State could otherwise be a limiting factor in disease control. Animal by-products and derivatives should be disposed of in accordance with environmental legislation regarding landfilling and waste incineration. To ensure consistency, waste incineration should be carried out in accordance with Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on waste incineration.

The risk of pathogen contamination during animal and animal products burial is a significant and current issue that has piqued researchers' interest. Traditionally, pathogens were thought to be destroyed or deactivated in soil during decomposition, but foot and mouth virus, E. Coli, campylobacter, salmonella, Leptospira, and water born protozoa such as Cryptosporidium and Giardia may be present in leachate produced from decomposing carcasses.

SEMEN COLLECTION AND CRYOPRESERVATION IN DOGS

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Keywords: *semen collection, semen freezing, cryopreservation, artificial insemination*

Semen collection and analysis of quality of the ejaculate is part of a complex examinations related to the health of the stud male before his inclusion in the breeding program. The evaluation of the ejaculate is based on the assumption that certain specific properties of the semen may reflect the ability of sperm to fertilise oocytes. Collections are performed to preserve the valuable genetic material by freezing of canine semen and its cryopreservation, so that the genetic material could be used in the distant future. A variety of freezing regimes, extenders and thawing protocols have been published in the literature. The authors have worked mainly with the TRIS-fructose extender with egg yolk as a protectant for cooling, and glycerol for freezing. This type of extender has given good results for dog semen over a number of years. Most commercial extenders for canine semen are based on modifications of the TRIS buffer, with either fructose, lactose or glucose sugars, and sometimes with membrane protective agents, such as sodium dodecyl sulphate. The main goal of cryopreservation is to preserve the motility and fertilising ability of sperm in a deep-frozen insemination dose for a long period of time. The basic principle of long-term cryopreservation of semen is its freezing to the temperature of liquid nitrogen (-196°C), changing the diluent and water in the sperm from liquid to solid state. In sperm, water is found in hypertonic solutions, it binds biochemically and colloidally, but in addition, a considerable amount is formed by the so called ,,free water,,. The preservative effect of low temperature can only be achieved by reducing the free water content in the cell, which slows them down significantly until all metabolic processes are stopped. The last integral part of the whole cryopreservation process is the thawing of the sample and its use in artificial insemination. Semen can be thawed by direct immersion in a preheated water bath, which ensures rapid thawing and reduction of the cryoprotectant. Progressive motility after thawing varies, but well-frozen semen can usually show motility of 60-70 % or even higher. Motility may also vary depending on the extender used, but the loss of motility should ideally not exceed 20% after thawing compared to the motility of the original fresh semen sample.

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COVID-19 AND ANIMALS

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Keywords: *Covid-19, coronaviruses, ACE2 receptors, SARS-CoV-2, minks, carnivores, apes, animal reservoir*

In general, coronaviruses are characterized by a broad host spectrum. In addition to humans, they can infect mainly animal species that have ACE2 receptors on their cells. These receptors, together with the enzyme furin, play a key role in the endocytosis of SARS-CoV-2 into the host cell. To date, the presence of SARS-CoV-2 has been confirmed in ferrets, domestic cats, dogs and civets, as well as minks, including wild American minks, snow leopards, lions, teddy bears, tigers and gorillas. These findings are important in terms of identifying possible animal reservoirs that can become a significant source of new outbreaks of coronavirus infections.

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SUSTAINABLE MANAGEMENT STRATEGIES FOR TREATED WASTEWATER IN MEDITERRANEAN REGION: LEBANON CASE

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Keywords: *sustainable management, treated wastewater, Circular Economy, DEWATS, NCWR, irrigation, climate change, Mediterranean region*

The Mediterranean basin countries, in particular the Middle East and North Africa, MENA region, have only 1% of the world's freshwater resources, accounting for more than half of the "water poor" population. Moreover, the region is under immense pressures on resources, the growing demand for water and the deterioration in the quality of surface and groundwater resources. This water scarcity is not only linked to increased demand, but also to poor treatment infrastructure and therefore pollution of water resources, climate change and water scarcity. According to reports of the Middle East Institute 2017, of the world's ten countries that are projected to suffer from the highest water stress by 2040, seven are in the MENA region.

On the other hand, more than 80% of the world's sewage is discharged untreated into the environment. In Lebanon, eastern Mediterranean, suffers a shortage and a sharp drop in the quantity of water available, from significant pollution of its water sources due to poor management of the water sector and the lack of fully and efficiently functioning wastewater treatment plants. Consequently, increased amounts of untreated sewage, combined with agricultural runoff and urban discharge, have degraded water quality and contaminated water resources. For this, a new approach for the efficient treatment and management of wastewater and bio-waste based on the transition to a circular economy in the water sector is described in this paper

According to the available statistical data, there are 166 wastewater treatment plants in Lebanon that are not functioning at all, or are not functioning in an acceptable manner, including more than 60 small failing plants that have been set up at the country level. This situation requires an urgent transition to a circular economy operation/design concept with a consequent resource recovery and more sustainable wastewater management. Natural resources have to be preserved, and wastes have to become an opportunity for recovering resources and materials (water reuse, byproducts, sludge reuse).

However, the strategies are based on eco-innovative systems to improve the sustainability of the wastewater management system, this solution is created on the construction of a modular and eco-friendly wastewater treatment plant for medium and small towns to be combined with the existing large, centralized wastewater treatment plants. This station is based on the imitation of natural processes using anaerobic digestion, constructed wetlands and solar treatment (Raceway Pond Reactor)

The strategies are mainly based on implementing eco-innovative technologies, low-cost, decentralized system reducing environmental contamination, recovering valuable resources, and producing reusable by-products for agriculture.

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MONITORING WATER RESOURCES IN ENVIRONMENT: A PUBLIC HEALTH CONCERN

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Keywords: *water resources, public health, SARS-CoV-2, RNA, wastewater-based epidemiology*

Monitoring water resources has been well practiced from early days to detect several diseases like typhoid, cholera, poliovirus, measles, influenza and others. The nature of water resources solely depends upon its source of origin and the stuffs /discharges or chemicals that merge into it during its movement from one place to other. During its movement, it not only is reused to feed crops, animals and household activities but also acts like an early warning system that could alter the penetration of specific microbial load or disease when move to one populated area to other populated areas. One of such alternation has been reported for the prevalence of SARS-CoV-2 virus (Covid-19 virus) in sewage waste water. Many recent studied found the presence of positive-sense single-stranded RNA or its fragment; a genetic material of SARS-CoV-2 in sewage water of suburbs areas despite of no new local cases reported. Hence, waste water monitoring provides a surveillance tool for the invasion, occurrence, prevalence, epidemiology studies of virus in a particular localities so that its potential eradication strategy can be implemented in a better and effective ways to narrow down the burden of both symptomatic and non symptomatic infection of virus at population level.

In this manuscript, a systematic review has been performed to address the concurrence of the Covid-19 virus in waste water through wastewater-based epidemiology (WBE) studies and recommend including SARS-CoV-2 screening along with other microbial screening before it distributed to a local communities. As wastewater management comprises a broad range of efforts that promote effective and responsible water use, treatment, disposal, and distribution, it needs to strengthen the viral scrutiny. This assists to mitigate the progression of Covid-19 to a certain extent which further ensure public health and welfare of humanity by some degree.

USE OF ZEOLITE AS A FILTER TO CAPTURE OPPORTUNISTIC PATHOGENS IN WATER

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Keywords: *zeolite, Cryptosporidium, water, Nested PCR*

Zeolites are microporous crystalline aluminosilicates with excellent absorption properties. The chemical structure of zeolite is formed by a network of channels and cavities, allowing easier penetration of molecules. They, therefore, serve as an effective filter that absorbs various substances (ammonia, heavy metals, pesticides, odours, radioactive cations and many other toxins. In addition, the aquaculture industry uses zeolite in fish and crustacean farming to improve water and feed quality; it is also used to inhibit ammonia accumulation in the transport of live fish. In this study, we compared the filtration properties of zeolite with different thicknesses and observed their ability to capture microorganisms found in water samples. We infected drinking water with faeces with a known number of oocysts of the parasite *Cryptosporidium parvum*, with 28 oocysts in one gram of the sample. We filtered a total of eight water samples with different oocyst concentrations using zeolites with a particle thickness of 0.2-0.6 mm and 0-0.3 mm. The filtration was followed by purification, centrifugation, and isolation using the DNA sorb B isolation kit. Detection was performed by molecular methods, specifically Nested PCR. Gel electrophoresis showed the presence of *Cryptosporidium parvum* in seven samples; the parasite was not found in the water sample with the lowest number of oocysts filtered through zeolite with smaller particles. The sequencing service confirmed the presence of *Cryptosporidium*, genotype IIaA11G2R1, in these samples.

PRACTICAL POSSIBILITIES OF MICROPLASTICS REMOVAL FROM WATER AND WASTEWATER

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Keywords: *microplastics, removal technologies, water, wastewater*

The paper presents a discussion on methods of microplastics removal from water and wastewater which could be used under full scale. The problem of microplastics presence in tap/ drinking water as well as in surface water is nowadays well recognized. It was stated that it is a great problem because this kind of micropollutants stayed common in rivers and lakes. Also, at least several dozen percent of drinking water samples are polluted by microplastic particles, including not only the tap water but also the bottled one. The efficiency of the technologies used for the removal of microplastics during water treatment for drinking purposes is of great interest. It was also stated that wastewater treatment plants significantly contribute to the pollution of the environment by microplastics although up to 99% of these pollutants are removed from wastewater during its treatment. The remaining, very small microplastics state a load of even several dozen million particles per year discharged into surface water. Filtration seems to be effective in microplastics removal from treated effluents, but only in the case of larger particles, of size 300 μm and more. Also, membrane processes seem to be effective in the separation of these micropollutants, they are however rarely used in municipal wastewater treatment plants. Should they be used more often? Many processes used in microplastics removal only cumulate the particles of polymer pollutants in solid or liquid phases. E.g. during coagulation high part of microplastics is effectively removed from the water phase, however they are cumulated in sludges. Similarly during filtration through classical filters or membranes, the microplastics are cumulated in washing water from filters or in concentrates, respectively. These media should also be treated, but in their case, the concentration of microplastics is higher compared to water and wastewater (also influents). Is it favorable when we design microplastics removal methods? The questions given above are of great importance, and in the paper, an attempt was made to discuss the subject comprehensively to work out recommendations on the problem of removal of microplastics on a technical scale.

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NOVEL INDUSTRIAL WASTEWATER TREATMENT PROCESS AND REUSE OF TREATED WATER IN SUSTAINABLE IRRIGATION PRACTICE – A GREEN TECHNOLOGY CONCEPT

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Keywords: *wastewater, biocarbon, sorption process, heavy metals, green technology*

Water is an essential life-sustaining element of daily life. Industrial water consumption makes up 22% of global water use. In developing nations industrial water use ranges from 4-12% of national water practice. The water crisis in both quantity and quality apparently becomes inevitable in such a changing world in terms of global environmental changes, the ever-growing population and pressures on global freshwater resources. As industrialisation in developing nations increases, industrial water use could potentially increase by a factor of five, strongly increasing pressure on water resources. The water scarcity and misuse of fresh water resources leads to serious concern on the sustainable economic development, food security and protection of the environment in combination with the climate change. Further, many industries are using large amount of fresh water for the production activities. It is also releasing large volume of wastewater into the environment and causes ecosystem damages. In the concept of environmental and economic sustainability, a proper wastewater management and water reuse system can help to a greater extent in the development of national economy. To cope with the water crisis, innovative approaches to source water management as well as reuse of treated wastewater have been proposed all around the world from a holistic perspective, based on integration of multidisciplinary framework. Reusing water in industry has the potential to reduce the costs of water supply and wastewater treatment by industries and reduces pressure on water resources. Wastewater can be reused within a business itself. It successfully reduces the amount of water used. Wastewater treatment and reuse between businesses can lower the costs of treatment for all businesses, thus making reuse options more economical.

In the current research, a green technology concept has been introduced to the treatment on industrial wastewater using a novel biocarbon technology. In this research, *Hibiscus rosa sinensis* L. plant leaves were used for the production of the biocarbon. It is an indigenous medicinal plant, widely available in nature, the leaves have rich carbon content. In this research protocol, three stages were involved. In the first stage, the metal adsorption capacity of the biocarbon was evaluated using Cr (VI) ions as model pollutant. The adsorption experiments were carried out in a batch reactor system with pre-determined experimental conditions. In the second stage, leather industry wastewater was subjected for treatment with biocarbon. In the third stage, the treated wastewater was used for the growth of certain plant species in a pilot scale farming land. The current experimental research, a leather industry wastewater containing total dissolved solids of 14800 mg/L were introduced in the reactor system, after the equilibrium time of 3 hrs; the concentration of TDS in outlet water was 1150 mg/L. The color of the leather industry wastewater was reduced to 98.50% and the level of COD was reduced to 98.20% with optimum biocarbon dose of 3.0 g/100 mL. In addition, a pilot scale farming practice was carried out in 12 x 12 sq. ft field for the growth of Fodder grass, Sataria clauca and Sorghum. The productivity results show faster growth of the species and 7.5 kg of biomass/sq.ft. The results indicates that, *Hibiscus rosa - sinensis* L. plant leaves biocarbon has excellent adsorption capacity in pollutant removal in the wastewater. Further, the wastewater can be reused for the growth of plants for may farming practice.

APPLICATION OF WATER RETENTION FACILITIES IN THE URBANIZED ZONES OF SLOVAK REPUBLIC

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Keywords: *water retention facilities, rainwater, urbanized zone*

Built-in and non-built-up parts of land in urbanized areas are currently usually drained by rainwater drainage. Environmental drainage brings with it a number of negative phenomena such as reduced humidity, microclimate change and the associated risks of allergic diseases. These trends can be reversed in urbanized areas by capturing rainwater on undeveloped parts of the land, which would also positively affect the local microclimate and hydrological conditions in the country, which are significantly negatively affected by the impact of climate change in recent years. Rainwater management in urban areas of towns and villages can be based on the principle of retaining rainwater in the environment where it falls. The current practice is focused on the fastest possible drainage of rainwater from the territory of urban areas by sewage water management networks to joint municipal wastewater treatment plants. Innovative solutions based on artificial rainwater retention in the city structures in the rain-free period, they allow this water to be used to improve the microclimate in the urbanized zone, irrigation of parks, resp. through recycling for other urban needs. In the world, these systems are often referred to as BMPs (Best Management Practices), it means rainwater management best practices.

Given the above facts, the article presents the potential use of water retention facilities in selected self-governing buildings located in built-up urban areas. Taking into account the different demands and needs of selected municipalities in interaction with the positive and negative aspects of specific water reservoirs for rainwater, the article points to the need to explicitly identify the factors determining the decision to procure a particular water reservoir. Based on a clear quantification of the weights of factors in terms of the principles of the Saaty matrix, the article presents their prioritization in the process of deciding on their procurement and subsequent implementation in terms of individual requirements of urban objects. In conclusion, using the SAW method, which was implemented as a maximization, it clearly identifies the most aqueous water retention system according to the clearly declared requirements of a particular municipality.

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