University of Agronomic Sciences
and Veterinary Medicine of Bucharest
Faculty of Land Reclamation
and Environmental Engineering

International Conference

"Agriculture for Life, Life for Agriculture"

BOOK OF ABSTRACTS

Section 5

LAND RECLAMATION, EARTH OBSERVATION & SURVEYING, ENVIRONMENTAL ENGINEERING

2025
Bucharest

University of Agronomic Sciences
and Veterinary Medicine of Bucharest

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CONTENTS

ENVIRONMENTAL SCIENCE AND ENGINEERING

DISASTER RESILIENCE AND SUSTAINABLE DEVELOPMENT

WATER RESOURCES MANAGEMENT

REMOTE SENSING AND GEOINFORMATICS

MISCELLANEOUS

ENVIRONMENTAL SCIENCE AND ENGINEERING

THE SHEAR STRENGTH PARAMETERS OF SOIL-ROOT SYSTEMS

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Abstract

The root systems of vegetation are fundamental in enhancing slope stability, with the shear strength of soil-root systems serving as a critical parameter for its assessment. The role of roots in stabilizing slopes has been extensively documented, and the use of vegetation for slope stabilization and soil erosion control is a well-established practice across many regions worldwide. This sustainable approach has even led to the emergence of new research disciplines focused on its development. This review article aims to synthesize and evaluate existing research on the shear strength parameters of soil-root systems across various plant species and soil types. Additionally, it examines how these parameters are affected when plant roots dry out due to hydric stress caused by recent climate change. The study provides insights into the impact of root desiccation on slope stability, highlighting the importance of understanding vegetation`s role in maintaining soil cohesion under changing environmental conditions.

Key words*: dried vegetation, living vegetation, shear strength, soil-roots.*

BIOMOLECULE PRODUCTION BY MICROORGANISMS ISOLATED FROM SALINE ENVIRONMENTS

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Abstract

Saline environments, characterized by extreme conditions, are unique habitats that harbor diverse microorganism communities capable of synthesizing biomolecules, such as extracellular hydrolytic enzymes and carotenoid pigments with significant industrial potential. These biomolecules are important in microorganisms' survival and adaptation to harsh environments. The present study aimed to isolate several new biomolecule-producing microorganisms from two salt wells (Curmătura and Băicoi, Prahova County, Romania). The strains NC18, NC21, NC28, and SB1 were isolated using a selective agar medium supplemented with 3.4 M sodium chloride (NaCl). Specifically, NC18, NC21, and NC28 were obtained from Curmătura, while SB1 was isolated from Băicoi. As a result of their ability to grow on agar medium with 1–5 M NaCl, all the new isolates were included in the extreme halophilic organisms. Based on their phenotypic and molecular characteristics, all these strains were included in the domain Archaea. The four isolates NC18, NC21, NC28, and SB1 were further assessed for their ability to produce extracellular hydrolytic enzymes, including lipase, protease, amylase, cellulase, xylanase, and pectinase, as well as carotenoid pigments. Due to their ability to produce a range of bioactive compounds, the halophilic isolates present promising opportunities for diverse biotechnological applications, such as industrial enzyme production, and the development of bio-based products.

Key words*: carotenoids, exoenzymes, halophiles, saline environment.*

ASSESSMENT OF SOIL CONTAMINATION BY POLYCYCLIC AROMATIC HYDROCARBONS (PAHS) IN BUCHAREST: SOURCES AND DISTRIBUTION

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Abstract

Polycyclic aromatic hydrocarbons (PAHs) are organic pollutants composed of two or more aromatic rings of carbon and hydrogen atoms. PAHs are characterized by low water solubility, low vapor pressure, high melting and boiling points. As the molecular mass increases, the lipophilic character increases, making them more persistent in the environment. Incomplete combustion is the main source of PAHs. This study evaluates PAHs contamination in soil samples collected from 30 locations in Bucharest, focusing on potential pollution sources such as industrial activities, vehicular emissions, and domestic sources. Industrial zones and high-traffic areas recorded the highest total PAH concentrations at 1.06 mg/kg and 1.01 mg/kg, respectively. Diagnostic ratios analysis suggests combustion as the predominant source of PAHs.

Key words*: diagnostic ratios, PAHs; soil pollution, urban contamination.*

SUSTAINABLE GEOPOLYMER BINDERS: MECHANICAL AND DURABILITY INSIGHTS INTO FLY ASH-BASED COMPOSITES

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Abstract

Geopolymers can be regarded as a type of sustainable and green building material, with the potential to significantly reduce carbon emissions when compared with conventional alternatives. The present study analyses the performance of geopolymeric binder-based composites that have been obtained by means of alkaline activation of fly ash, which is an abundant industrial waste. The present research is centred upon the evaluation of mechanical properties, such as compressive strength and flexural strength, as main characteristics of their durability. A further objective of the project was to investigate the influences of various factors on the final properties of the material. The experimental findings suggest that the optimized mixture displays enhanced performance regarding durability and sustainability. This suggests that the material has considerable potential for use in a variety of construction applications. The study provides detailed insight into the potential of this innovative material, which contributes to the development of environmentally friendly construction technologies.

Key words*: alkaline activator, Circular Economy, fly ash, geopolymer binder.*

POSSIBILITIES OF SURFACE TREATMENT OF PLASTERS BASED ON CLAY

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Abstract

One of the key challenges associated with traditional buildings constructed from vernacular materials is their response to climatic agents and microorganisms. These present a significant challenge also for the surface of constructions based on unbaked clay elements. This paper presents the possibility of creating plasters based on clay, lime and other additives, their behaviour in response to mould growth, and the potential for coating treatments to enhance their resistance to the harmful action of microorganisms. The antifungal treatment was conducted with the objective of exploring the potential for recycling expired non-food household and medical products. The experimental results indicated the initial development of colonies of Penicillium notatum and Aspergillus niger and subsequently demonstrated the potential for enhancing resistance to mould action through pellicular treatment and/or surface impregnation. It can therefore be concluded that not only is it possible to create clay-based plasters with enhanced performance, but also that this represents an original contribution to the implementation of the concept of the circular economy.

Key words*: antifungal treatment, circular economy, clay soil, plaster mortar, vernacular constructions.*

EVALUATION OF THE POSSIBILITIES OF USING CLAY SOILS FOR THE REALIZATION OF VERNACULAR CONSTRUCTIONS

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Abstract

Since time immemorial, mankind has sought solutions to the problem of creating sustainable living spaces that provide thermal comfort and good indoor air quality. One of the most prevalent techniques has been the construction of buildings from clay-based materials. Nevertheless, even at the present time, this method is still insufficiently regulated by generalised regulations. The principal issue is the diversity of raw material characteristics, which necessitates a considerable number of preliminary tests and a lengthy period of time. This paper puts forward an interdisciplinary methodology for the analysis of clayey earth, with a view to determining the potential applications of this material in the production of adobe-brick masonry elements and plastering mortars for vernacular construction. The research methodology entailed a pedological analysis of 30 clay soil samples sourced from Mârgău and Ciucea region, Cluj, followed by an evaluation of their suitability for construction applications. The experimental findings have indicated the potential for establishing limiting conditions regarding the clay, sand, and dust content of the soils, in conjunction with pH, humus, and carbonate levels.

Key words*: antifungal treatment, circular economy, clay soil, plaster mortar, vernacular constructions.*

POSSIBILITIES FOR THE RECOVERY OF AGRICULTURAL VEGETABLE WASTE

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Abstract

Agricultural activities generate substantial volumes of waste and by-products annually, primarily of plant origin, which are either underutilized or not utilized at all. Through partial pyrolysis, these waste materials can be transformed into a product known as "biochar (BCH)," which has potential applications in both agriculture and innovative construction materials. This paper presents a comparative study examining the impact of BCH utilization in these two fields. Research findings demonstrated beneficial effects on soil quality and crop yield improvement. Additionally, studies conducted on cementitious composites incorporating 5-15% biochar revealed reduced density, increased open porosity, maintained mechanical strength parameters, and thermal conductivity values that suggest the possibility of developing innovative mortars with enhanced thermal resistance or suitable for manufacturing paving elements. Through this dual approach, this paper aims to highlight the potential of transforming agricultural waste into valuable materials that benefit both agriculture and the development of new, innovative, and environmentally friendly construction materials.

Key words*: agricultural sub-products, benefits for agriculture, biochar, innovative cementitious composites.*

INDICATORS OF THE STRUCTURAL AND COMPOSITIONAL DIVERSITY OF STANDS ON DEGRADED LANDS IN THE VRANCEA AREA

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Abstract

The ecological reconstruction of degraded lands was based on the predominant use of pine species (Pinus nigra and Pinus sylvestris), resulting in pure stands or sometimes mixed with deciduous trees, with a fragile structure, prone to damage. The research was carried out during 2023-2024, in 18 research areas located on degraded lands in the Vrancea area, in stands of different ages with the aim of the knowledge of compositional and structural indicators that reflect the intensity of competitive processes. The results indicate a pronounced predisposition to disturbances in pure young stands, with a high level of compositional homogeneity and relative abundances of Scots pine. The relationship between the structural diversity index (Gini) and the coefficient of variation allowed the determination of the structure type of the stand, the correlation coefficient being significant (r = 0.9923). Research has shown that mixed stands are more structurally stable than pure stands, promoting mixed species being essential in increasing the resistance of stands. The results are useful for decision-makers, the goal being to create stands with structures resistant to the action of damaging factors.

Key words*: degraded lands, pine species, structural and compositional diversity.*

DEVELOPMENT AND APPLICATION OF AN OPTIMIZED TD-GC/MS METHOD FOR MONITORING VOLATILE ORGANIC COMPOUNDS (VOCs) IN AMBIENT AIR

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Abstract

Volatile Organic Compounds (VOCs) are organic chemicals with high vapor pressure, originating from natural and anthropogenic sources, and are major contributors to environmental issues like photochemical smog and atmospheric pollution. This study introduces an optimized TD-GC-MS method for detecting and quantifying VOCs in ambient air, employing internal standards and certified reference materials to ensure analytical accuracy and traceability. The method is designed to deliver exceptional sensitivity, precision, and reproducibility, suitable for diverse environmental conditions. Key improvements include optimized thermal desorption, fine-tuned chromatographic separation, and calibrated mass spectrometric detection. Aligned with Eurachem guidelines, the integration of internal standards mitigates instrumental variability, while certified reference materials ensure traceable calibration, enhancing result reliability. The research demonstrates the method`s applicability to air quality monitoring, environmental assessments, and public health research. The findings validate TD-GC-MS as a robust, reliable solution for continuous VOC monitoring and routine environmental applications, providing critical insights into pollution sources and impacts, particularly in urban and industrial contexts. This research addresses the needs of scientists, policymakers, and environmental professionals seeking effective tools to combat air pollution.

Key words*: air quality monitoring, environmental pollution, GC-MS, thermal desorption, Volatile Organic Compounds.*

BEHAVIOR OF ASPHALT MIXTURES MANUFACTURED WITH RECYCLED MATERIALS AND THEIR *IN SITU* PERFORMANCE LEVEL

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Abstract

In the context of several solutions that can be used to improve the performance of asphalt mixtures during their service life, the paper presents a case study in which asphalt mixtures are manufactured using some recycled materials such as glass, plastic and rubber. The level of performance will be quantified both by the rheological properties measured by conventional tests (viscosity, permanent deformation etc.), but also by some tests that take into account the change in response over time and that lead to variation curves for the stiffness modulus, yielding and fatigue resistance etc. Asphalt mixtures with different percentages of recycled materials will be studied and the results obtained from dynamic and rheological tests before and after the aging process will be compared and interpreted. Determining the degree of influence of recycled materials on the aging resistance of modified asphalt mixtures and characterizing the dynamic and rheological properties can lead to optimizing the percentages of additions and choosing the most advantageous solution based on multi-criteria analyses in different climatic and stress conditions.

Key words*: asphalt mixtures, performances, recycled materials, service life.*

INTEGRATION OF UAV-BASED LIDAR, PHOTOGRAMMETRY, AND SLAM TECHNOLOGIES FOR THE COMPLETE ABOVE AND BELOW GROUND MAPPING OF MOUNTAINOUS HYDRO-TECHNICAL INFRASTRUCTURE

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Abstract

The comprehensive mapping and inspection of both underground and above-ground terrain in mountainous environments pose significant challenges for engineering projects, particularly those involving legacy infrastructure. This study presents an integrated geospatial methodology for the rehabilitation and modernization of the Tomesti micro-hydropower station in Timiș County, Romania. By combining GNSS-based control networks, UAV photogrammetry, airborne LiDAR, and handheld SLAM scanning, the project achieved high-resolution data acquisition across complex topographies and inaccessible subsurface structures. Ground control points were established using total stations to ensure millimetric precision and consistent georeferencing of all datasets. The workflow delivered orthophotos, digital surface and terrain models, detailed topographic plans, and 3D reconstructions of the interior hydro-technical gallery. These outputs formed the foundation for updated technical documentation and supported engineering analyses for structural rehabilitation and eco-friendly water intake systems. The results confirm that modern geomatics, when anchored in classical surveying practices, provides a robust framework for accurate assessment, design, and environmental integration. This case study underscores the value of multi-sensor approaches in repurposing abandoned infrastructure for sustainable energy production and demonstrates their practical relevance in mountainous terrain.

***Key words**: 3D, LiDAR, SLAM, topographic mapping, UAV.*

EVALUATION OF CHEMICAL COMPOSITION OF ESSENTIAL OIL AND TOXIC METAL ACCUMULATION OF TARRAGON (*ARTEMISIA DRACUNCULUS* L.) CULTIVATED ON METAL-CONTAMINATED SOILS

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Abstract

This study evaluates the quality of tarragon essential oil, toxic metals content, and the growth potential of tarragon on heavy metal-contaminated soils. Tarragon demonstrated tolerance to toxic metals and can be cultivated on highly polluted soils. The levels of toxic metals in tarragon essential oil were below the Maximum Permissible Concentrations. Based on translocation and bioconcentration coefficients, tarragon is a Cd, Pb, Zn and Hg excluder and suitable for phytostabilization. Tarragon essential oil exhibits a mixed sabinene/elemicin/isoelemicin/ methyleugenol chemotype and could be used in the pharmaceutical, cosmetic, and related industries.

Key words*: essential oil, phytoremediation, polluted soils, tarragon, toxic metals.*

ENERGY-ENVIRONMENT INTERACTIONS FOR AN IMPROVED SUSTAINABILITY OF DAMBOVITA COUNTY – THE ROLE OF INNOVATION AND TECHNOLOGY TRANSFER FROM UNIVERSITIES

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Abstract

The paper presents an assessment of the status of the sustainability of Dambovita County with special attention to the energy and environment interactions. A society seeking sustainable development ideally must utilize only energy resources that cause low or no environmental impact meaning no emissions released to the environment. In this matter, several indicators were analyzed and discussed such as increasing the share of renewable energy sources and low-carbon fuels in the transport sector (electric vehicles), including alternative fuels, and environmental issues in terms of energy conservation and renewable energy technologies, together with limitations on increased energy efficiency, and the relations between energy and sustainable development, and between the environment and sustainable development. To complete this complex approach, the role of innovation and technology transfer from universities actively involved in regional development was briefly discussed.

Key words*: critical analysis, energy efficiency, energy-environment interaction, low emissions, sustainable development goals.*

ECOMONITORING STUDIES OF GROUNDWATER AND SOIL FOR POLLUTION WITH OIL AND PETROLEUM PRODUCTS

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Abstract

The results of ecological monitoring studies of groundwater and soils in the region of the city of Plovdiv, East Aegean Basin, and Ecoregion 7 Eastern Balkans are presented. The studies were necessary as a result of the repair activities carried out on a damaged oil pipeline. The results obtained from the physicochemical monitoring of waters and soils are discussed (electrical conductivity, odour, turbidity, pH, colour, anthracene, aromatic hydrocarbons, acenaphthene, acenaphthylene, benzene, benz(a)pyrene, naphthalene, petroleum pyrene, polycyclic petroleum products, fluorene, fluoranthene, phenanthrene, chrysene), with the application of the existing standards. The exceedances of the monitored indicators of water quality for irrigation of crops, for the adjacent sources of surface water, and these oils are assessed. An ecological assessment of the groundwater and soils studied is presented. The health risks from using anthropogenically influenced groundwater and soils for plants, animals, and humans have been assessed. Measures to improve the ecological state have been identified.

Key words*: chemical state, ecological assessment, groundwater, health risk assessment, pollution, soils.*

CHEMICAL STATE AND ECOLOGICAL ASSESSMENT OF ATMOSPHERIC AIR QUALITY

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Abstract

Research was conducted on the state of atmospheric air in the region of the village of Voyvodino, Maritsa municipality, and Plovdiv district, Bulgaria, influenced by industrial sources of impact. The indicators of main pollutants of the atmospheric air above populated areas were measured (PM_{10}, SO_2, CO, NO_2, NO, O_3, Benzene, Toluene, m-p-xylene, o-xylene). The research was carried out according to established standards. The chemical and ecological state is presented. The air quality index is analyzed. An ecological assessment of the state of atmospheric air was carried out. The risk to human health, the impact of pollution on living organisms, on protected species, habitats and territories was assessed. Measures to improve the ecological state of the air have been identified.

Key words*: air pollution, air quality index, chemical state, ecological assessment, industrial impact.*

BIOACCUMULATION OF CADMIUM, LEAD, ZINC AND COPPER IN RED FESCUE (*FESTUCA RUBRA* L.) GROWN IN POLLUTED MEADOWS IN COPSA MICA

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Abstract

Studies on the influence of heavy metals are essential because they have a negative impact on human and animal health, the environment, and ecosystems. This work aims to assess the heavy metals content in soil and plant (Festuca rubra L.) samples collected from permanent grasslands in a heavily polluted area during 2023–2024. The total content and DTPA extractable forms of cadmium (Cd), lead (Pb), zinc (Zn), and copper (Cu) in soil and plant were analyzed. The mean value of total Cd content in soil was 5.50 mg/kg dry weight (DW), while the mean values for Pb, Zn and Cu were 201.1 mg/kg DW, 368.7 mg/kg DW and 46.9 mg/kg DW, respectively. In the plant the mean Cd content had the lowest value (0.47 mg/kg DW), the second lowest mean value was recorded for Pb, while the Zn content was the highest (47.6 mg/kg DW). The values of the correlation coefficients showed that heavy metals uptake by Festuca rubra varies according to the type of metal and its form in the soil. The results of this research showed that soils in the Copșa Mică area continue to have a high content of heavy metals, which may have a negative impact on the quality of human and animal life through their accumulation in the food chain.

Key words*: bioaccumulation, Festuca rubra L., heavy metals, meadows, pollution.*

GROUND AIR MICROFLORA STUDY USING A CASCADE IMPACTOR

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Abstract

Urban air pollution poses significant public health risks, with airborne microorganisms contributing to air quality concerns and respiratory illnesses. This study investigates the distribution of airborne microflora using a six-stage cascade impactor. Samples were collected from three urban hotspots, three park areas, and a natural control site in Sofia, Bulgaria. Microbial counts were analyzed across six particle size fractions to determine spatial distribution patterns. Hotspots showed significantly higher microbial loads, especially in larger particle fractions (>7 µm, 4.7-7 µm), whereas densely forested green areas exhibited lower microbial levels with a shift toward finer fractions (2.1-3.3 µm, 1.1-2.1 µm). Parks with minimal vegetation showed microbial patterns similar to hotspots. These findings underscore the role of urban vegetation in mitigating microbial air pollution and highlight the importance of incorporating forested green spaces into urban planning to enhance air quality and public health.

Key words*: air microorganisms, air microflora, cascade impactor, green zone, hotspots.*

STRUCTURAL INTEGRITY IN EARTHEN ARCHITECTURE WITH NDT METHODS

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Abstract

The resurgence of earthen construction highlights the environmental, economic, and aesthetic benefits of natural materials. Non-Destructive Testing (NDT) methods are important for assessing the integrity and performance of earthen structures without physical damage. This article reviews key NDT techniques, including ultrasonic testing, electrical resistivity tomography, nuclear magnetic resonance, time domain reflectometry, infrared thermography, and acoustic emission testing, emphasizing their role in evaluating moisture content, mechanical properties, and thermal performance. Despite their advantages, challenges such as material variability, lack of standardized protocols, and specialized training persist. Future efforts must focus on standardization, advanced technologies, and improved data interpretation to maximize NDT's potential. By overcoming these obstacles, the construction industry can ensure the structural integrity and sustainability of earthen materials, promoting broader acceptance of earthen construction and fostering resilient, eco-friendly building solutions.

Key words*: NDT, Earthen Constructions, Structural Integrity, Structural Health Monitoring.*

STUDIES AND MEASUREMENTS FOR THE IDENTIFICATION OF NOISE AND VIBRATION LEVELS IN A SITE IN BUCHAREST - CASE STUDY

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Abstract

Specific studies and research are necessary to find out the existing noise and vibrations coming from various zonal sources, in an urban area where a new building will be placed. Depending on the activity that will be carried out in the new building, it is necessary to obtain certain maximum values of the noise and vibration levels, inside the building, so that the psychoacoustic comfort of the inhabitants can be achieved during the period of use of the building. As part of a research contract, carried out by INCD URBAN INCERC, INCERC Bucharest Branch, for a client who wanted to build a new residential building for his family, on-site experiments were carried out at the client`s land located in Bucharest. The results of the acoustic measurements, the values of the noise levels, are presented numerical and in graphic forms in the frequency range 12.5...20000 Hz. For vibrations the recordings are presented in the form of time-histories for accelerations and velocities, as well as Fourier spectra and response spectra.

Key words*: acoustics, vibrations, civil buildings, urban polluting sources.*

HYDROTHERMAL ASSESSMENT OF MAIN AGRICULTURAL AREAS IN SOUTHERN ROMANIA AND NORTHEN BULGARIA

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Abstract

In these papers, the bioclimatic index de Martonne was used to assess the hydrothermal conditions in some agricultural areas in southern Romania and northern Bulgaria during the period 1961-2020. The conditions from October to June were analyzed in view of the cultivation of winter cereals, as well as those from April to October, marking the time for growing spring crops. Additionally, indices were selected during some critical periods for both types of crops. The evaluation of the indices with the Mann-Kendall test and the Sen slope shows a significant (0.01) negative trend or an increase in the degree of unfavourability for growing winter crops in the Danube Plain. The indices during the period for growing rain fed spring crops 1961-2020 also show a negative, but insignificant trend.

Key words*: de Martonne index, southern Romania, northern Bulgaria, spring crops, cereal, trends.*

NUMERICAL STUDY OF THE CYLINDRICAL SHAFT'S BEHAVIOUR USING 3D FINITE ELEMENT METHOD

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Abstract

The numerical modelling of the cylindrical shafts can be done using finite element method in axisymmetric or three-dimensional conditions. For this study, the 3D finite element method has been used to analysed the cylindrical shaft's behaviour regarding the earth pressure distribution, the vertical displacements of the soil and the horizontal displacements of the diaphragm wall. Thus, a parametric study has been carried out in which the cylindrical shafts radius, the length of the diaphragm wall and the excavation depth have been varied. For all the numerical models, the cohesive and cohesionless soil has been used. The results show the influence of all these parameters on the retaining walls' behaviour. Also, the influence of the soil type is explained.

Key words*: 3D finite element method, cylindrical shafts, lateral displacements, excavation.*

CLIMATE CHANGES: GLOBAL AND LOCAL CONCERNS

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Abstract

Among the concerns of the scientific community worldwide, climate change stands out, of interest to different levels of modern society, and signifies one of the main social, economic and political challenges, currently facing humanity. Although long-term modifications of the weather models and temperature, the two topics to which climate change refers, can be the results of natural sources such as the activities of volcanos or sun, the anthropogenic sources represent the main source since the 1800s. The adverse impact of climate change on the people lives and health will become increasingly pronounced in the coming decades, as it affects the most basic requirements for health: adequate shelter, sufficient food, safe water and clean air. In this context, our studies focused on exploring global and local research on the main causes and consequences of actual climate change, underlining the need to continue efforts to mitigate them. The findings emphasize that climate change is real, and people need to become aware of the climate emergency and actively support climate action by understanding the need to address the challenges it poses.

Key words*: climate changes, global warming, health effects, human activities.*

EVALUATION OF WASTE BIOMASS FROM AROMATIC PLANTS FOR ENERGY PURPOSES

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Abstract

This study aims to evaluate the feasibility of obtaining energy from waste biomass. The potential of waste biomass from aromatic plants, left after the production of essential oils, was assessed. The calorific value, ash content, volatile compounds, and moisture content were determined. Elemental analysis of the waste biomass was conducted to measure the C, H, N, and S contents. The results indicate that residual waste has significant potential as a quality feedstock for solid biofuel production. Compared to coal, the calculated emission factors demonstrate a reduction in CO and CO_2 emissions by up to 30%, NOx by up to 80%, SO_2 by up to 99%, and dust by up to 67%, depending on the waste used. When selecting suitable waste for energy production, it's essential to balance calorific value and emission factors. If energy efficiency is the priority, lavender, tansy, and thyme waste may be preferred. However, for sustainability and lower environmental impact, common sage waste could be the better choice. It's important to consider the specific context, including regulations and energy needs, when making a final decision.

Key words*: biofuel, elemental analysis, emission factors, waste.*

FIRE SAFETY OF ETICS BASED ON EPS TYPE POLYSTYRENE

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Abstract

Due to the requirements to reduce energy consumption, the thermal rehabilitation of existing buildings has gained momentum in recent years, both in Romania and at the European level. The most accessible and used technical solution for the thermal rehabilitation of residential buildings, is represented by the external cladding systems with polystyrene thermal insulation (ETICS). For this type of building thermal insulation system, the most unfavorable and most common external actions are represented by compartment fires. The researchers of the Construction Fire Safety Laboratory within the INCERC Bucharest Branch, have carried out a series of experimental studies on a natural scale, in order to develop a method of testing ETICS systems for fire generated from fire compartments. Through these studies and experimental research, conclusive results were obtained regarding the development of compartment fires, the evolution of temperatures inside the combustion chamber and the propagation of fire on the combustible facades of buildings.

Key words*: cladding systems, compartment fires, experimental research, fire resistance tests.*

GROUND MOTION DATA QUALITY ASSURANCE: FUNDAMENTAL REQUIREMENTS AND THEIR PRACTICAL IMPLEMENTATION WITHIN THE NATIONAL NETWORK FOR THE SEISMIC MONITORING AND PROTECTION OF BUILDING STOCK, NIRD URBAN-INCERC, ROMANIA

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Abstract

The participation of the National Network for the Seismic Monitoring and Protection of Building Stock (RNMPSPC) at NIRD URBAN-INCERC in EPOS ERIC, the pan-European Research Infrastructure for Solid Earth Science, requires a rigorous framework for ensuring high-quality seismic data. This paper presents key criteria for seismic data quality assurance and their implementation within RNMPSPC, which operates a strong-motion network of 64 stations across Romania. We detail modern methodologies for seismic data acquisition, processing, and validation, emphasizing compliance with international standards. The practical application of these methods is illustrated using records from a recent ML 5.4 earthquake in the Vrancea seismogenic zone. The study highlights ongoing improvements in equipment, software integration, and data management to enhance the accuracy and reliability of ground motion records. These advancements support seismic hazard assessment and structural safety, reinforcing Romania's contribution to global seismological research.

Key words*: quality assurance, research infrastructure, Romania, seismic network, seismic data.*

ANALYSIS OF GROUNDWATER RESOURCES IN STARA ZAGORA DISTRICT, BULGARIA: QUALITY AND ENVIRONMENTAL RISKS

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Abstract

Groundwater, a vital resource in Bulgaria, is increasingly at risk of contamination from anthropogenic activities. A study in the Stara Zagora district for a year, situated in an area with strong anthropogenic pressure (urbanization, 4 TPPs, open-pit mining of lignite coal, large military training ground, intensive agriculture) assessed the groundwater quality of 6 wells (Ws) and 6 springs (Ss), based on 48 samples, analyzing 11 physicochemical (colour, taste, odour, pH, EC, TH, Cl^-, SO_4^{2-}, NH_4^+, NO_3^-, and OM) and 3 bacteriological (AMO, E.coli and Enterococci) parameters. The groundwater partly meets the Bulgarian standards as a natural resource (W1, W2 - summer, autumn and winter, W3 - summer and winter, S1, S2, S5 - autumn, and S6) and as a source for drinking (W1 and S2 - except for spring, W2 - except for spring and autumn, S1 and S6 - except for summer, autumn and winter). The deviation from the norms of groundwater as a natural resource results from pollution with NH_4^+, NO_3 and OM, and for drinking purposes: with E. coli, enterococci, AMO, OM, NH_4^+ and NO_3. Agriculture and livestock waste were identified as major pollution sources. Many positive and negative Pearson correlations existed between controlled groundwater parameters. Immediate treatment of contaminated Ws and Ss, and regular monitoring and health risk assessments are essential to mitigate groundwater pollution and ensure safe water for consumption.

Key words*: environmental risk, groundwater, physico-chemical and bacteriological parameters, quality assessment.*

EVALUATING AGGREGATE CONTENT AND ITS EFFECT ON CLAY MORTAR PERFORMANCE

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Abstract

The most used material in the construction sector is arguably cement, the production of which generates massive amounts of greenhouse gases, contributing approximately 5-8% of global CO2 emissions. A potential solution in this context is the use of inorganic binders from local sources, a trend that is gaining momentum in research studies within the construction materials industry. Clay-based masonry mortar represents a viable, eco-friendly, and cost-effective solution, with its components being abundantly available worldwide. Clay has demonstrated its effectiveness as a binder over centuries. In its natural, calcined, or modified forms, clay serves as an important alternative to cement, offering sustainable material development at lower costs and with reduced environmental impact. Clay is a sedimentary rock, whose main ingredient is aluminium silicate, characterized by its colloidal appearance and binding properties. The primary feature of clay is its ability to absorb large amounts of water, transforming into a pasty, ductile mass that can be easily shaped into any form.

Key words*: clay composite, local materials, mortar.*

PRELIMINARY RESULTS VALIDATION ON THE THEORETICAL AND EXPERIMENTAL APPROACH FOR USING SPENT GARNET RESIDUES OF ROMANIAN LOCAL INDUSTRIES IN CONSTRUCTION MATERIALS

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Abstract

Waterjet cutting is an industrial method that uses high-pressure water jets to cut a variety of materials such as metals, concrete, wood, ceramic, stone, rubber, foams, plastic, etc. For improving the procedure performance, in terms of speed and cutting accuracy, abrasive agents like red garnet sand is mixed with the water, generating the Abrasive Water Jet (AWJ) methodology. This is known to present environmental drawbacks, including the production of wastewater, garnet sludge and corresponding dried wastes, and microscopic particles from the cut materials, still disposed in household landfills, which generate severe environmental issues. Using Garnet Sand (SG) wastes in cementitious materials (mortars and concrete) as partial aggregate substitution is an innovative approach to enhance sustainability in construction, offering several benefits like increased strength, durability performance, etc., reduced production costs due to the re-using material approach and ecological protection as well. Preliminary studies in this direction were conducted in the last years within NIRD URBAN-

INCERC Timisoara branch, showing encouraging results in the proposed aggregate substitution proposal in the regular mortar mixes, in accordance with initial international studies in the field. The current paper aims to confirm the initial results by specific extension of the research area, reaching some critical parameters, like SG material source variation, as a mandatory validation procedure of preliminary conclusion and foundation of further specific studies regarding the viability of the SGs recycling opportunities in construction products and their effective use.

***Key words**: aggregate substitution, Circular Economy (CE), green building design, recycling, Spent Garnet (SG).*

MONITORING THE INACTIVE LANDFILL STABILITY IN GORJ COUNTY

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Abstract

Monitoring landfill stability is critical in mining operations to prevent failures that could have significant environmental and safety implications. Site characterization is a comprehensive approach to monitoring landfill stability in order to conduct detailed geological assessments to understand the composition, structure, and physical properties of the tailing material, to perform laboratory tests to assess the engineering properties, all these correlated with geodetic repeated measurements. Techniques and instruments used in geodetic monitoring are chosen depending on the type of surveyed displacement and level of accuracy required. Photogrammetric and remote sensing technologies play an essential role in the detection and monitoring displacements and deformations, providing crucial support in the rapid and effective management of these emergencies. These techniques allow for large-scale, continuous monitoring of slope movements without requiring direct contact with the slope. This way, it ensures precise deformation monitoring, validates theoretical models, enhances predictive capabilities, and supports safety, regulatory compliance, and environmental protection efforts. A well-designed monitoring system not only ensures compliance with environmental regulations but also provides valuable insights for designing effective mitigation and rehabilitation strategies.

Key words*: displacement and deformation, environmental protection, geotechnical assessment, monitoring landfill stability, photogrammetric and remote sensing technologies.*

STUDY ON THE DYNAMICS OF CEREALS CULTIVATED IN TULCEA COUNTY IN THE CONTEXT OF CLIMATE CHANGE

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Abstract

Climate change in recent decades has had a significant impact on Romanian agriculture. In this context, Tulcea County, located in the south-eastern part of the country, has experienced a trend of increasing average annual temperatures, an increase in the number of days with temperatures above 30°C and a decrease in total annual precipitation. The study analyzed meteorological data, the evolution of crop structure, cultivated area, and yield trends over a 20-year period (1994-2023). The results showed an increase in average annual temperature from 12.39°C in 1994 to 13.8°C in 2023. Precipitation was low and showed significant variability, ranging from 215.8 mm in 2022 to 732 mm in 1997, with uneven distribution during the crop growing season. The area planted with cereals for grain varied considerably, influenced by both the predicted climatic conditions and the extent of irrigated land. Statistical analysis was performed using the Python software package, applying Pearson correlation tests to examine the relationship between climatic variables and agricultural yields. Linear regression methods were also used to identify long-term trends. The statistical tests showed that both increasing temperatures and decreasing precipitation were correlated with declining maize and wheat yields, highlighting the vulnerability of agriculture to climate change. Maize production ranged from a minimum of 323 kg/ha in 2003 to a maximum of 8,820 kg/ha in 2018. The overall trend indicates a slight decrease in average production ($R^2 = 0.41$, $p < 0.05$), correlated with increasing temperatures. Wheat showed a more stable yield, reaching a maximum of 4,738 kg/ha in 2021. The production trend was positive in periods with moderate rainfall ($R^2 = 0.63$, $p < 0.01$).

Key words*: cereals, climate change, crop yields, heat stress, precipitation trends.*

USING GROUND PENETRATING RADAR AND PHOTOGRAMMETRY FOR HYDROCARBON POLLUTION ASSESSMENT IN CONTAMINATED AREAS: AN INTEGRATED APPROACH FOR ENVIRONMENTAL MONITORING

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Abstract

This paper presents the use of ground-penetrating radar (GPR) and photogrammetry in the assessment and monitoring of hydrocarbon contamination in polluted areas. The integrated approach combines the advantages of both techniques to provide a detailed image of pollution distribution in the soil and potential migration pathways of contaminants. The GPR, used to detect underground anomalies, was complemented by photogrammetry to obtain accurate mapping of the microrelief and terrain structure. The studies were conducted through electrical resistivity measurements and field surveys, with the collected data being integrated into a detailed geophysical model. This combined method allowed for the identification of hydrocarbon accumulation zones and their migration according to the geological structure and infiltration conditions. The results obtained are essential for understanding the impact of pollution on the surrounding environment and for developing efficient solutions for monitoring and rehabilitating affected lands.

Key words*: contamination, hydrocarbons, monitoring, photogrammetry, soil.*

AFFORESTATION OF SANDY SOILS OF OLTENIA - A REVIEW

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Abstract

Oltenia is the region in southwestern Romania facing significant challenges related to desertification, especially in Dolj County. Sandy soils from this area present specific characteristics due to the low water retention, low nutrient content and limited organic matter typically found in these types of soils. Afforestation could be an essential solution to prevent desertification in this region, which faces significant risks related to land degradation. Afforestation of sandy soils, however, requires a multifaceted approach, combining soil improvement techniques, careful species selection, water management and continuous monitoring. With the right strategies, it is possible to restore ecological functions and to improve fertility of these types of soils. The key to success lies in understanding the specific challenges of sandy soils and adapting techniques accordingly to promote the growth and sustainability of forested areas.

Key words*: afforestation, aridity; desertification, Oltenia region, sandy soils.*

INNOVATIVE BIOTECHNOLOGICAL STRATEGIES FOR ENHANCING PHOSPHORUS BIOAVAILABILITY AND SUSTAINABLE AGRICULTURAL PRACTICES

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Abstract

Phosphorus is a vital nutrient for all forms of life, serving as a key component of essential cellular molecules, including nucleic acids, phospholipids, and adenosine triphosphate. The application of phosphorus-based chemical fertilizers is a common agricultural practice to ensure optimal crop yields. However, excessive phosphorus accumulation in soils can pose environmental risks, as it may be transported to freshwater bodies via surface runoff, leading to eutrophication. The aim of this study is to enhance the bioavailability of various forms of phosphorus present in soil that can serve as phosphorus sources. This is achieved by leveraging the capacity of Bacillus megaterium to mobilize both organic and inorganic phosphorus. Experimental results have demonstrated that inoculation of soil with Bacillus megaterium significantly enhances the mobilization of otherwise unavailable phosphorus fractions, converting them into plant-accessible forms. These findings highlight the potential of this biotechnological approach to reduce dependency on chemical phosphorus fertilizers while minimizing environmental risks, such as eutrophication, caused by excess runoff.

Key words*: Bacillus megaterium, biotechnological strategies, phosphorus, sustainable phosphorus management.*

SOIL FLUX AND SOIL GAS MONITORING OF A NATURAL LABORATORY FOR THE STUDY OF CO_2 LEAKAGE

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Abstract

Carbon capture and storage (CCS) is a technology designed to reduce greenhouse gas emissions by capturing CO_2 from industrial processes or power generation and securely storing it in geological formations. Băile Lăzărești serves as a promising natural laboratory for studying the environmental effects of potential CO_2 leakage from an anthropogenic CO_2 storage site and for testing monitoring solutions. One effective method for environmental monitoring of CO_2 geological storage involves soil flux and soil gas surveys, which can identify potential CO_2 leakage points by determining the natural variability of CO_2 flux. Since 2019, several soil flux surveys have been conducted at Băile Lăzărești across different seasons, combined with soil-gas measurements. By analyzing seasonal CO_2 variation along with geological knowledge, we have determined the natural variability of post-volcanic emissions and important for monitoring CO_2 geological storage sites, aiding in the identification and understanding of potential leakage in the near-surface environment.

***Key words**: CO_2 geological storage, leakage detection, monitoring, natural laboratory, soil flux surveys, soil gas-surveys.*

HEAVY METAL ACCUMULATION IN FOOD CROPS CULTIVATED IN CONTAMINATED SOILS IN ALBANIA

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Abstract

The consumption of vegetables and fruits is a major pathway for human exposure to heavy metals, especially when these elements accumulate in edible plant parts. This study assessed the accumulation of nickel (Ni), chromium (Cr), zinc (Zn), iron (Fe), and manganese (Mn) in soils and food crops cultivated near a former metallurgical plant in Elbasan, Albania. The analyzed crops included onion, salad, potato, pepper, and strawberries. Bioconcentration factors (BCFs) were calculated to evaluate the capacity of each crop to uptake heavy metals from the soil. Available metal concentrations in soil were determined using the Mehlich-1 extraction method and quantified by atomic absorption spectrometry. The results indicated that Mn, Zn, Fe, and Cr concentrations in potatoes, and Fe levels in pepper, were within WHO safety limits. However, Fe levels in onion, salad, and strawberry, Ni in all edible crops, and Cr in onion, salad, strawberry, and pepper exceeded recommended thresholds. The calculated BCFs confirmed notable metal accumulation, particularly for Ni and Cr. These findings highlight the need for regular monitoring of heavy metal levels in both soil and crops to safeguard food safety and public health.

Key words*: accumulation, available metals, bioaccumulation factor plants (BFP), food crops, heavy metals.*

THE IMPACT OF ABIOTIC STRESS ON *GALIUM VERUM* AND *HELICHRYSUM ITALICUM*: PHYSIOLOGICAL AND BIOCHEMICAL RESPONSES

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Abstract

Plants face environmental stressors, including abiotic factors like drought and flooding. To adapt, they employ defenses such as physical barriers, chemical compounds, and volatile organic compounds (VOCs) that attract natural enemies of herbivores. This study examined the responses of Galium verum and Helichrysum italicum plants to drought and flooding under controlled conditions. Secondary metabolites were analyzed using HPLC, VOC emissions with GC-MS, and photosynthetic parameters through gas exchange systems. Results showed that abiotic stress significantly impacted photosynthetic efficiency, chlorophyll content, VOC emissions, and polyphenol concentrations. Secondary metabolite profiles varied based on environmental conditions and plant origin. The findings underscore the adaptive capacity of these plants to cope with stressors, offering valuable insights into their resilience mechanisms. This research highlights the potential of Galium and Helichrysum in improving stress tolerance, with applications in ecological restoration and sustainable agriculture. *Acknowledgment: This work was supported by a grant from the Romanian National Authority for Scientific Research, CNCS – UEFISCDI, project number PN-IV-P8-8.3-ROMD-2023-0022.*

***Key words**: abiotic stress, climate changes, secondary metabolites, volatile organic compounds.*

SOLUTIONS FOR THE RESTORATION IN THE NATURAL CIRCUIT OF CONTAMINATED SITES FROM THE PETROLEUM INDUSTRY

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Abstract

The restoration of sites contaminated by the petroleum industry aims to mitigate negative effects on the environment, and human health, and facilitate the reuse of significant land areas. In addition to reducing soil contaminant concentrations, another objective of restoration is the rehabilitation of the vegetation layer. The use of sewage sludge in decontamination processes can provide nutrients and microorganisms, potentially forming the basis for vegetation layer regeneration. However, the application of sewage sludge can also have negative environmental impacts due to high concentrations of heavy metals and the presence of various pathogenic microbiota. This study presents an experimental investigation into the potential use of sewage sludge for remediating petroleum-contaminated sites and regenerating the vegetation layer. Lawn grass was sown in the remediated soil treated with sewage sludge to study its development. Using combined SEM-EDX and electrochemical methods, we analyzed the plant microstructure and the distribution of chemical elements to evaluate turf growth. The results obtained are promising and open new research perspectives for the use of sewage sludge in the remediation of sites contaminated by the oil industry.

Key words*: bioremediation, environment, petroleum, pollution, sewage sludge.*

STRUCTURAL ANALYSIS OF SLUDGE FROM THE ARAD WASTEWATER TREATMENT PLANT: REDUCING QUANTITY AND ENHANCING ITS POTENTIAL AS FERTILIZER

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Abstract

Sludge from sewage treatment plants is a byproduct of wastewater treatment processes, consisting of solid particles, microorganisms, and organic and inorganic substances. It is generated during sedimentation and digestion processes to remove contaminants such as organic matter, heavy metals, and chemicals from water. Before storage or disposal, sludge is typically treated to reduce its volume and eliminate pathogens. Standard treatment methods include dehydration, biological stabilization, and incineration. Depending on its composition, treated sludge can be repurposed for agricultural use as fertilizer, provided it meets strict regulatory standards to prevent soil and groundwater contamination. In Romania, sewage sludge is generally classified as waste under European and national legislation. According to the European Union Waste Directive 2008/98/EC, sludge is considered waste if it cannot be safely treated, recovered, or reused. Studies have explored its potential environmental risks, including soil contamination and its suitability as a fertilizer. This article presents a structural sludge analysis, focusing on its physicochemical properties and moisture content. Experiments were conducted to evaluate the behavior of sludge samples under varying temperatures, exposure durations, and drying conditions. Results showed that evaporation rates increased with temperature, with significant differences observed between ventilated and non-ventilated drying environments. At temperatures ranging from 50°C to 100°C, sludge mass consistently decreased, with the lowest masses recorded in ventilated drying processes at 100°C. In non-

ventilated conditions, the percentage of evaporation increased progressively with prolonged heat treatment. Additionally, heavy metal concentrations in the sludge were experimentally determined and found to be below the limits imposed by national legislation. These results confirm that the analyzed sludge samples are suitable for agricultural use, aligning with regulatory requirements.

***Key words**: chemical composition, heavy metals, sludge, unventilated currying, ventilated heat currying.*

PHOTOSYNTHETIC AND BIOCHEMICAL CHARACTERIZATION OF *RAPHANUS SATIVUS* PLANTS UNDER DROUGHT AND OZONE EXPOSURE

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Abstract

In the summer of 2022, Europe experienced its most severe drought in 500 years, profoundly impacting agriculture and ecosystems. Concurrently, researchers investigated the short-term effects of elevated ozone (O3) levels on plant leaves and photosynthetic activity, identifying significant damage and alterations in photosynthesis. This study examines the responses of Raphanus sativus plants to drought and ozone exposure, focusing on photosynthetic parameters, chlorophyll content, VOC emissions, and total phenols and flavonoids in three varieties: Johanna, Helga, and Rozaria. To mimic real-world conditions, plants were subjected to drought stress for seven days and exposed to 100 ppb ozone for one minute. Photosynthetic parameters were monitored using a gas exchange system. VOC emissions were analyzed using gas chromatography-mass spectrometry (GC-MS). Photosynthetic pigments, such as chlorophyll a, chlorophyll b, and zeaxanthin, were identified and quantified using the UHPLC-DAD system. The results revealed that drought stress and ozone fumigation individually reduced net assimilation rate and stomatal conductance. Photosynthetic pigments concentrations decreased under both stress conditions. These findings highlight the differential tolerance of Raphanus sativus varieties to abiotic stressors and provide insights into their physiological and biochemical responses.

Key words*: abiotic stress, climate change, ozone, secondary metabolites.*

CLAY APPLICATION IN THE REMEDIATION OF NICKEL RICH SOIL

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Abstract

The objective of this study was to evaluate the ability of clay (nano- montmorillonite) to the remediation of natural (Ni) rich soils, having the nickel hyperaccumulator Odontarrhena calchidica test plant. The experiment was conducted in a greenhouse in a completely randomized design, with three replicates. The experiment was conducted in 2 kg plastic plot. We used four doses of clay: 0.0, 21.4, 44.3 and 64 g kg^{-1}, corresponding to 0, 30, 60 and 90 t ha^{-1}, respectively. Throughout the experiment, the plants were regularly irrigated, and NPK fertilization was applied to ensure optimal growth conditions. After 60 days, the soil analyzed for total nickel in XRF and available nickel $_{DTPA}$ extraction in Atomic Absorption. The BFP and BFR of Odontarrhena chalcidica decreased significantly as a function of increasing doses of nano-montmorillonite, indicating an increase in the adsorption of nickel in the soil. However, the BFP and BFR values were high, indicating hyperaccumulation potential of O. chalcidica. Based on the results, the application of clay in agricultural nickel rich soils favors their improvement.

Key words*: clay, nano-montmorillonite, hyperaccumulator, Odontarrhena calchidica, XRF.*

AMBIENT AIR POLLUTION: A GLOBAL HEALTH CRISIS

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Abstract

Air pollution is a significant environmental and public health threat, contributing to approximately 7 million deaths annually, as reported by the World Health Organization (WHO). Major pollutants such as particulate matter (PM_{10} and $PM_{2.5}$), carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2) are linked to severe health conditions such as cardiovascular diseases, strokes, respiratory illnesses, chronic obstructive pulmonary disease (COPD), and cancer. Vulnerable populations - the elderly, children, pregnant women, and individuals with pre-existing conditions - face the highest risks. Long-term exposure to air pollution has been associated with a tenfold increase in health complications compared to short-term exposure. While research has clarified many of the biological pathways through which pollutants affect human health, ongoing studies continue to explore the full extent of these effects. This study provides a comprehensive analysis of the latest data on the health effects of ambient air pollution, with a particular focus on Bulgaria. It identifies key trends, examines policy gaps, and evaluates the effectiveness of existing air quality regulations. By incorporating a comparative analysis of WHO, EU, and Bulgarian air quality standards, this research underscores the pressing need for stricter regulatory measures and enhanced mitigation strategies to curb pollution-related morbidity and mortality. The findings highlight the urgency of aligning national air quality policies with WHO guidelines to safeguard public health and drive sustainable environmental initiatives.

Key words*: ambient air pollution, air pollutants, air quality, diseases, health impacts, regulatory policies, WHO guidelines.*

VALIDATION OF A UHPLC-HRMS METHOD FOR THE ASSESSMENT OF PER AND POLY-FLUOROALKYL SUBSTANCES (PFAS) IN BIOTA

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Abstract

PFAS are present in freshwater fish in the Danube River, posing concerns about aquatic ecosystem contamination and adverse effects on human health. These substances also referred to as "forever chemicals" have the potential to accumulate in the food chain and provoke several health issues, including hormonal imbalance and cancer. In this work, the QuEChERS extraction and clean-up method combined with UHPLC-HRMS (Ultra-High-Performance Liquid Chromatography – High-Resolution Mass Spectrometry) was applied for the determination of 18 PFAS in muscle tissue of freshwater fish (European wels catfish – Silurus glanis). The method was validated in terms of Specificity, Linearity, Precision (% RSD), Recovery, and Accuracy (mean spike recovery, %) at two levels of concentration: 0.1 and 5 ng. Additionally, the study assessed the impact of matrix effects on PFAS detection in fish tissue.

Key words*: Danube River, freshwater fish, mass spectrometry, PFAS, QuEChERS.*

EXPLORING THE QuEChERS-GAS CHROMATOGRAPHY APPROACH FOR SEDIMENT PESTICIDE ANALYSIS

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Abstract

Pesticides have been classified as the most harmful substances in the world because of their extensive application, toxicity, and persistence. Hydrophobic chemicals, such as pesticides, have a considerable tendency to sorb to organic matter in sediment and soil. Measuring pesticides in sediment is crucial for monitoring their environmental fate and possible toxicity because they are typically found at higher concentrations in sediment. Since many hydrophobic substances do not break down easily, they remain in the environment for a very long time. This study aims to develop an integrated approach to extracting and quantifying pesticides from sediment samples using QuEChERS-gas chromatography techniques. The extraction of organochlorine and organophosphorus pesticides from the sediment sample was achieved by slightly modifying the QuEChERS method. The extracted compounds were identified and quantified by gas chromatography with a triple-quadrupole mass detector. Organochlorine pesticides or their degradation compounds provided the majority of the target substances. Monitoring pesticide content in sediments is essential for understanding bioaccumulation and long-term environmental effects, as well as for promoting sustainable agricultural practices.

Key words*: chromatography, pesticides, sediments, QuEChERS.*

INVESTIGATION OF THE PHARMACEUTICALS PRESENCE IN THE SOMOVA PARCHEȘ AQUATIC COMPLEX

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Abstract

The Somova Parcheș Aquatic Complex is part of the Danube Delta Biosphere Reserve and hosts a wide variety of fauna and flora species of community importance. This complex is fed with a significant volume of water from the Danube River, thus influencing the quality of the lake ecosystems. For this reason, the present study aims to investigate the presence of certain classes of pharmaceutical residues in water sampled from 6 lakes, namely Somova, Parcheș, Morun, Potica, Babele, Câșla, as well as their ability to accumulate in the tissues of fish collected from the same study area. Extraction of pharmaceutical compounds was performed using the solid phase extraction method for water samples and the QuEChERS method for fish tissues. Results obtained from analyses using high-performance liquid chromatography coupled with high-resolution mass spectrometry revealed the presence of the pharmaceutical compound caffeine in most water samples and its tendency to accumulate in some fish organs, such as the gills.

Key words*: fish tissue, pharmaceutical residues, Somova Parcheș Aquatic Complex, water.*

ASSESSMENT OF IRON, COPPER, AND ZINC IN THE MUSCLE OF PONTIC SHAD: INFLUENCE OF YEAR, WEIGHT, AND LENGTH

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Abstract

This study aimed to analyze the concentrations of iron (Fe), copper (Cu), and zinc (Zn) in pontic shad (Alosa immaculata) and assess the influence of factors such as capture year, length, and weight on these concentrations. Fish samples were collected during the 2023 and 2024 fishing seasons. After recording the length and weight of each specimen, the muscle underwent acidic digestion. The concentrations of Fe, Cu, and Zn were then determined using a Total Reflection X-ray Fluorescence (TXRF) spectrometer. The results revealed an overall increase in chemical elements concentrations from 2023 to 2024. While Cu levels showed no correlation with length or weight, Fe and Zn exhibited strong correlations with these parameters.

Key words*: Alosa immaculata, chemical elements, correlation, Total Reflection X-ray Fluorescence (TXRF).*

A CRITICAL REVIEW OF SUSTAINABLE APPROACHES FOR REDUCING THE ENVIRONMENTAL IMPACT OF PLASTIC PRODUCTION

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Abstract

The production of plastics in the context of global warming contributes to water pollution by microplastic particles. Consequently, a shift towards sustainable practices in the field of plastic production is crucial. This paper aims to address the main concerns related to plastic and microplastic pollution and to identify environmentally sustainable strategies applied in the production sector. A particular focus is placed on biodegradable, eco-friendly materials as alternatives to conventional plastics, with an emphasis on their environmental impact. For example, food waste has emerged as a promising alternative for plastic packaging production, offering a sustainable solution, valorization of by-products, and mitigating environmental impacts. The paper also focuses on the potential of using waste to create biodegradable materials, highlighting the importance of a zero-waste approach to enhance the economic value of by-products, while promoting a cleaner environment and waste management presented in environmental contexts. Through its comparative analysis, this study contributes to a deeper understanding of waste management and supports the advancement of a sustainable circular economy.

Key words*: biodegradable, by-products, microplastics, pollution, sustainable.*

THERMAL CONDUCTIVITY OF SILTY SOILS IN THE SOUTH-EAST REGION OF ROMANIA

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Abstract

The thermal properties of loess soil are essential for the distribution of heat generated by electrical cables in wind turbines. In these systems, where high-intensity electrical flow induces conductor heating through the Joule effect, the ability of the soil to facilitate heat transfer has a direct impact on the energy efficiency, operational safety and the durability of the electrical infrastructure, as inefficient thermal diffusion can lead to conductor overheating, affecting electrical resistance, degrading insulation and reducing cable lifespan. This study investigates the effects of density and moisture content on the thermal conductivity of silty soils at different compaction levels. Experimental tests were conducted on loessial soil samples compacted to 85-90% of the maximum dry density determined by the modified Proctor test. All measurements included the determination of dry-out curves to observe the variations of thermal conductivity with a gradual decrease in moisture content. The results indicate an increase in thermal conductivity with higher degree of compaction due to reduced porosity and improved particle contact.

Key words*: dry-out curve, loess, thermal conductivity.*

SWELLING PRESSURE OF ACTIVE CLAYS ACCORDING TO VARIOUS TECHNICAL NORMS

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Abstract

The main geotechnical parameter indicating the presence of active clays is the swelling pressure, which is globally determined using at least three different methods. In Romania, however, the swelling pressure is determined using only one method (through the compressibility test in oedometer on initially flooded samples). Regardless of the method used, the initial moisture content significantly influences the results. Two types of moisture content are typically considered: natural moisture content (according to NP 126-2010) and the shrinkage limit (according to STAS 1913/12-88). In current practice, the initial moisture content is usually the natural moisture content. However, by saturating the sample, only the swelling characteristics of the soil are identified, not the shrinkage characteristics. This article aims to synthesize the methods for determining the specific properties of active clays, based on international technical standards and norms.

Key words*: active clays, laboratory tests, swelling pressure, technical norms.*

A PIONEERING STUDY ON THE INVESTIGATION OF MICROPLASTIC POLLUTION IN THE WATER OF THE SOMOVA-PARCHEȘ LACUSTRINE COMPLEX, ROMANIA

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Abstract

Although the presence of microplastics in the oceans was first reported in the 1970s, the first studies on lakes were published in 2011. This pioneering study aims to determine the presence of microplastics in the Somova-Parches lacustrine complex, situated in the predeltaic territory of the Danube Delta Biosphere Reserve. The Pollution Load Index (PLI) was also calculated to assess the microplastic pollution level in water. The microplastics concentrations in the water of the 6 lakes investigated varied in the 0.2-0.65 particles·m-^{3} range. The PLI index values indicated a low level of microplastic pollution (level 1). The results of the micro-FTIR analyses highlighted the predominant presence of polyethylene and polypropylene polymers in the composition of the collected microplastics. The present study contributes to bridging the knowledge gap regarding the occurrence of microplastics in freshwater.

***Key words**: lakes, microplastics, pollution load index, polymers.*

INVESTIGATING CURRENTS, FLOW VELOCITIES, AND RIVERBED MORPHOLOGY - AN ADCP-CENTRIC APPROACH TO UNDERSTANDING HYDRODYNAMICS AND EROSION PATTERNS

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Abstract

The sediment movement on a river plays a crucial role in safe navigation and economic activities on navigable channels. Environmental changes in time are given by the morphological characteristics of the riverbed during seasonal water variation on the Danube River. This study presents a comprehensive assessment of the Danube River`s velocity and current characteristics based on Acoustic Doppler Current Profiler measurements. The correlation between flow velocities and depths helps to understand the factors that influence sediment patterns and provides insights into the sustainable management of the river system. The study was conducted along a 71-kilometer length of the Sulina Branch from the Danube River, where ADCP measurements were collected at multiple locations and over periods. The data collected included water depth, flow velocity, and current direction. By clustering the column depth cell velocities it revealed significant spatial and temporal variations in the velocity and current patterns, influenced by factors such as river morphology, discharge, and seasonal changes.

Key words*: ADCP survey, currents direction, Danube discharge, hydro-morphology, water flow velocities.*

DISTRIBUTION OF HEAVY METALS IN THE DANUBE RIVER ECOSYSTEM AND THE IMPACT ON THE ENVIRONMENT. A REVIEW

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Abstract

The Danube Basin collects water from nineteen countries and is exposed to significant amounts of pollutants. Heavy metals such as lead (Pb), cadmium (Cd), mercury (Hg), arsenic (As), chromium (Cr), nickel (Ni), zinc (Zn), copper (Cu), aluminum (Al) are considered critical contaminants of aquatic ecosystems, given their high predilection to enter and accumulate in food chains. The primary sources of heavy metal pollution consist of discharges from agricultural waste, industrial and urban wastewater into the aquatic environment, as well as mining activities. Given their persistence in the environment, it is required to conduct studies on heavy metal concentrations to understand their implications for aquatic life and to assess biomagnification through food chains. For this purpose, various pollution indices are utilised to evaluate the chemical speciation of metals within the environmental system. Shortly, it is essential to prioritize the development of technologies that can facilitate the recovery of harmful heavy metals, while mitigating potential risks to the environment.

Key words*: bioaccumulation, Danube River, heavy metals.*

ADVANCING URBAN AIR POLLUTION MONITORING WITH REMOTE SENSING AND LOW-COST SENSOR TECHNOLOGIES

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Abstract

Urban air pollution poses a critical challenge due to rapid urbanization, increasing vehicular emissions, industrial activities, and infrastructure expansion. Accurately assessing pollution levels and pinpointing emission sources is essential for effective environmental management. This study integrates advanced remote sensing techniques with cost-effective sensor technologies to monitor air quality in an urban setting. Mobile measurements were conducted on April 18, 2024, using the UGAL MDOAS system and the Sniffer 4D sensor, both mounted on a vehicle. The UGAL MDOAS system employs Differential Optical Absorption Spectroscopy (DOAS) to detect atmospheric trace gases, while the Sniffer 4D utilizes electrochemical sensors to quantify pollutant concentrations. This study focuses on measuring and comparing NO_2, O_3, SO_2, and PM levels from both instruments. Additionally, data collected from mobile platforms were cross-referenced with stationary air quality monitoring stations to evaluate consistency and assess the influence of localized emission sources. The findings contribute to enhancing urban air pollution monitoring by demonstrating the effectiveness of hybrid measurement approaches in identifying pollution hotspots and improving air quality assessments.

Key words*: air pollution, air quality assessment, DOAS, low-cost sensors, remote sensing, urban monitoring.*

COMPREHENSIVE ANALYSIS OF PARTICULATE MATTER VARIABILITY IN AN URBAN ENVIRONMENT USING RAPID-E MONITORING

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Abstract

Fine particulate matter (PM) pollution is a significant environmental and public health concern in urban areas. This study presents an extensive assessment of PM concentrations in Galați, Romania, using the RAPID-E monitoring system. The equipment was deployed at the RI REXDAN (Research Infrastructure REXDAN - Cosbuc no. 98) to continuously measure PM concentrations at 0.3, 0.5, 1, and 5 µm from December 31, 2023 (22:00) to December 30, 2024 (22:00). The collected data were analyzed to determine temporal variations in particulate matter, including monthly means, daily averages, weekday versus weekend patterns, and variations between working days and weekends. By identifying key pollution trends and fluctuations over the monitoring period, this study provides insights into the dynamics of urban air quality and potential emission sources. The findings contribute to a better understanding of PM pollution variability and support the development of effective air quality management strategies in urban environments.

Key words: *air pollution, air quality assessment, particulate matter, PM variability, RAPID-E, temporal analysis, urban monitoring.*

ASSESSMENT OF SUSPENDED SEDIMENT CONCENTRATION AND GRANULOMETRY USING AQUASCAT 1000S ON THE SULINA BRANCH OF THE DANUBE RIVER

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Abstract

This study presents an analysis of suspended sediment concentration and granulometric distribution along the Sulina branch of the Danube River, based on data collected using the AQUASCAT 1000S acoustic backscatter system. Measurements were conducted at six monitoring stations near or between the localities of Sulina, Gorgova, Crișan, Maliuc, Partizani, and an intermediate station between Sulina and Crișan. The AQUASCAT 1000S was employed to gather high-resolution acoustic data using its four frequency channels, ranging from kilohertz to megahertz, allowing for simultaneous observation of both fine and coarse sediment fractions. Data processing involved comparative analyses using different combinations of acoustic channels to evaluate their effectiveness in characterizing sediment concentration and size distribution across diverse hydrological and morphological conditions along the branch. Results reveal spatial variability in suspended sediment characteristics, influenced by local hydrodynamics and proximity to tributaries, human settlements, and natural channels. The study highlights the advantages and limitations of multi-frequency acoustic techniques in riverine sediment monitoring and contributes to the development of improved methodologies for sediment characterization in deltaic environments.

Key words*: AQUASCAT 1000S, Danube River, granulometry, multi-frequency analysis, Sulina branch, suspended sediment concentration.*

ADVANCED GC-MS/MS AND LC-MS/MS METHODS FOR THE SCREENING OF PESTICIDES AND BROMINATED FLAME RETARDANTS IN COMPOST AND SOIL

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Abstract

Many legacy and emerging chemicals pose significant environmental concerns due to their persistence, bioaccumulation potential, toxicity, and widespread presence in the environment. Among those are organochlorine (OCs) and organophosphate (OPs) pesticides, as well as brominated flame retardants (BFRs). This study aimed to develop GC-MS and GC-MS/MS methods for the targeted analysis of selected OCs (1,2,3,4,5,6-hexachlorocyclohexane (HCH) isomers, aldrin, and chlordecone) and OPs (dichlorvos, chlorpyrifos, and chlorpyrifos-methyl), along with LC-Q-TOF-MS methods for hexabromocyclododecanes (HBCDs) in soil and compost samples. Two extraction techniques, namely accelerated solvent extraction (ASE) (using a DCM: hexane 1:1 mixture) and Soxhlet extraction (using toluene), were evaluated, followed by clean-up procedures using silica-based chromatographic columns. Good recoveries were obtained for aldrin, α-HCH, β-HCH, and δ-HCH. However, further optimization of the Soxhlet and ASE methods is needed to ensure acceptable recoveries. The results showed that GC-MS/MS and LC-Q-TOF-MS are efficient methods for the quantification of OCs, OPs, and BFRs in complex matrices as soil and compost, highlighting their applicability for environmental monitoring and contamination assessment.

Key words*: ASE, clean-up, compost, GC-MS/MS, LC-Q-TOF-MS, soil.*

MATHEMATICAL MODEL FOR PREDICTING NO_2 CONCENTRATIONS IN THE SOUTHEASTERN REGION OF EUROPE USING RECURSIVE LEAST SQUARES FILTER METHODS

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Abstract

Nitrogen dioxide is found in the atmosphere as a key ingredient in the photochemical formation of smog and acid rain. Nitrogen dioxide is a poisonous gas that is formed during combustion. Toxic at high concentrations, it reacts with moisture in the air to form nitric acid, which is highly corrosive and dangerous to plants and animals. In this study, we present a predictive model for nitrogen dioxide concentrations measured between 2017 and 2024 at ground level in a national network of monitoring stations. The model is based on a statistical approach to measurements from 152 automatic measurement points, with an hourly resolution. The analysis carried out allowed the construction of a mathematical model in order to make an effective prediction. The algorithms used were of the Recursive least squares filter type. The application used was made possible by running dedicated software in PyCharm. It was found that the model for daytime concentrations depends linearly on a series of parameters monitored by the national network.

Key words*: algorithm, Nitrogen dioxide, RLS, statistical analysis.*

HIERARCHY OF ALTERNATIVES FOR THE REHABILITATION OF ASBESTOS WATER SUPPLY NETWORKS BASED ON ENVIRONMENTAL CRITERIA

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Abstract

Asbestos water supply networks are not believed to represent a significant hazard to public health in normal use. However, repair, rehabilitation and removal of asbestos pipes involve cutting, polishing, and demolition, can release asbestos fibers into the air, posing risks to public health. Many water utilities currently have significant portions of their water mains composed of asbestos pipes that need to be rehabilitated. This paper focuses on the evaluation of four different alternatives to rehabilitate/remove of asbestos pipes, considering the impact on the environment, respectively the total air emissions generated by the activities involved in this rehabilitation. A very performant model, EMEP/EEA air pollutant emission inventory guidebook 2019, was used for this assessment. Results indicate that the replacement of asbestos-cement pipes with no-dig, pipe-bursting technology, which involves laying the new pipe on the inside of the existing pipe, which is broken but remains underground, will have the lowest environmental impact.

Key words*: asbestos-cement pipes, emissions of pollutants, water supply networks.*

USING RENEWABLE ENERGY SOURCES IN A PUBLIC EDUCATIONAL BUILDING TO ACHIEVE CLIMATE CHANGE MITIGATION AND ADAPTATION

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Abstract

The transition to low-carbon construction practices is essential in the context of rising global temperatures and stricter climate policies. This study evaluates the role of renewable energy sources (RES) in mitigating climate change impacts through the energy design of a new kindergarten building located in Romania. Results indicate that RES technologies can cover the entire need of the building's primary energy, with a total annual energy production of 40,000 kWh. CO_2 emissions are reduced by approximately 95%, compared to a baseline scenario without RES. Additional modelling under future climate stress conditions confirms the building's capacity to maintain energy autonomy and operational stability, with only moderate system upgrades required.

Key words*: climate change mitigation, CO_2 emissions reduction, energy modelling, renewable energy sources.*

DISASTER RESILIENCE AND SUSTAINABLE DEVELOPMENT

THE INTEGRATION OF CERAMIC WASTE AS A PARTIAL SUBSTITUTE OF NATURAL AGGREGATES IN EXPERIMENTAL CONCRETE RECIPES

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Abstract

The work aimed to show that it is feasible to integrate ceramic waste from the construction industry and demolitions into the content of concrete recipes, as a partial replacement for natural aggregates in standard concrete recipes. The integration of these wastes into the composition of concrete is of particular importance because, on the one hand, we reduce the amount of waste resulting from the construction industry, and on the other hand, we achieve savings of raw materials used in the manufacture of concrete, coming from exhaustible natural resources. Compared to the standard C16/20 concrete recipe used as the control sample in the experimental recipe, the natural aggregates of size 4-8 mm were partially replaced by 50% with ceramic waste. Various physical-mechanical tests were performed, such as determining the density of fresh concrete, determining the compressive strength of concrete containing ceramic waste compared to a standard concrete recipe containing natural aggregate. Following tests on experimental recipes, very good results were obtained in determining the compressive strength, which were similar to the test results on standard concrete recipes.

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Key words*: ceramic waste, concrete, natural aggregates.*

DURABILITY AND SUSTAINABILITY OF MOUNTAIN FARMS IN ROMANIA WITH A FOCUS ON AGRICULTURAL DIVERSIFICATION

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Abstract

This study highlights the durability and sustainability of mountain farms, focusing on agricultural diversification as a method of adaptation and development. Mountain regions in Romania face significant challenges, such as climate change, population migration, and declining agricultural incomes. Diversifying agricultural products proves to be an effective solution for increasing the resilience of these farms, enhancing both food security and economic stability. The article examines development strategies, public policies for mountain areas, and support initiatives, including a case study on their implementation. Through an integrated approach, this study emphasizes the necessity of combining agricultural traditions with innovation to ensure a sustainable future for mountain farms. In conclusion, agricultural diversification is not just a survival strategy but also an opportunity for sustainable development in mountain communities.

Key words*: agricultural diversification; durability; mountain farms; resilience; sustainability.*

RISK OF WINDTHROWS STANDS WITH VARIOUS STRUCTURES USING VERTICAL DIFFERENTIATION INDEX

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Abstract

This study investigates how different stand structures influence vulnerability to windthrows, using the vertical differentiation index as an analytical tool. Measurements were conducted in three forest districts containing stands with varying structures: even-aged, relatively even-aged, relatively uneven-aged, and uneven-aged. Findings indicate that the vertical differentiation index has subunit values close to zero in even-aged stands and approaches one in uneven-aged stands. A significant inverse correlation was observed between this index and the percentage of wood affected by windthrows. These results underscore the importance of diversifying stand structures in Romanian forest management to mitigate ecological and economic losses.

Key words*: correlation, stand structure, vertical differentiation index, windthrows.*

NATURE-BASED SOLUTIONS FOR THE SUSTAINABLE DEVELOPMENT OF GREEN AND BLUE INFRASTRUCTURE IN ROMANIA

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Abstract

Romania faces challenges related to climate change, such as rising temperatures, floods, and droughts, while urban areas struggle with air and water pollution. The growing public awareness of sustainability and environmental protection creates a favorable context for the large-scale implementation of such infrastructure across the country. This research provides a detailed classification of green and blue infrastructure types, highlighting their diversity and the specific functions each fulfills in improving urban life. Green and blue areas are essential for improving urban life quality and protecting the environment. The growing significance of green and blue infrastructure is reflected in Romania's urban laws and policies, highlighting a shift towards sustainable development and city resilience. However, implementing this is difficult due to the lack of a single legal definition, causing inconsistent use and confusion. Additionally, there is no cohesive national strategy, and legal frameworks addressing different aspects are uncoordinated. Local authorities also need clearer guidelines and better methods for planning, designing, and managing these infrastructures effectively.

Key words*: climate change, environmental quality, sustainability.*

UPGRADING THE TRADITIONAL DATABASE THROUGH BIM-BASED SHM VISION

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Abstract

Structural Health Monitoring (SHM) is a technology and methodology designed to assess the condition of structural systems by evaluating potential damage that may occur after an earthquake. Building Information Modeling (BIM) tools provide storage and visualization capabilities for digitally representing a building, incorporating raw data such as photographs, measurements, point clouds, and damage information. This paper presents a framework aimed at enhancing traditional databases. It integrates data collected from various sensors installed within a structure, employing post-processing techniques like finite element analysis to evaluate the health of both structural and non-structural elements. Additionally, the soil conditions are taken into account during these assessments. The collected information is then incorporated into a BIM environment featuring an improved interface that enhances connectivity between the two system architectures. This integration utilizes standardized file formats as defined by ISO standards. Developing scientific and experimental databases for building structures is an emerging trend in global research and a key component of the Romanian National Strategy for Seismic Risk Reduction. Digital building information models facilitate real-time updates and improve coordination among intervention teams following significant earthquakes.

Key words*: damage, digital data, earthquake, monitoring.*

COMPATIBILITY BETWEEN NATURAL AGRO-INDUSTRIAL BY-PRODUCTS AND SYNTHETIC MATERIALS, A BASIC ELEMENT IN OBTAINING BIOCOMPOSITE MATERIALS WITH POTENTIAL FOR USE IN CONSTRUCTION

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Abstract

Agriculture is one of the main sources generating significant quantities of natural agro-industrial by-products, such as stalks, fibrous residues, husks and cobs, etc. Based on the principles of the circular economy, such natural materials can have numerous possibilities for superior valorization, often as biocomposite materials, in various fields, not least in construction. Starting from the recognized potential for valorization of natural agro-industrial by-products in this sector, the paper presents aspects regarding the importance of compatibility and interaction between two natural materials, namely rice husks and industrial hemp fibers, and a synthetic resin as their binder. The implications of the compatibility and interactions between such types of materials and how this can influence the evolution over time of some characteristics of the biocomposite material expected to be used in the construction field as coatings are also presented.

Key words*: adhesion, coatings, hemp, pre-reaction time, rice husks.*

INSAR TECHNOLOGY FOR RISK MANAGEMENT AND NATURAL DISASTER IMPACT ASSESSMENT IN BUCHAREST

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Abstract

The study analyzes the use of InSAR technology and validated data for risk management and natural disaster impact assessment, focusing on the subsidence in Bucharest, associated with underground works and activities, and earthquakes. The TerraSAR-X and TanDEM-X satellites provide crucial information for rapid mapping, spatial analysis, and thematic mapping, supporting effective responses to earthquakes, floods, and other hazards. The analysis identifies ground changes based on radar data using techniques such as Persistent Scatterers (PS) and Small Baseline Subset (SBAS). The study integrates decision analysis into the ILWIS software, using the multi-criteria method (SMCE) to assess vulnerabilities along the M5 Metro Line. The methodology involves structuring problems, evaluating alternatives, and prioritizing solutions, demonstrating the applicability of innovative tools in reducing urban risks. The results highlight the importance of advanced technologies in risk prevention and management, providing recommendations for reducing the impact of subsidence and improving urban planning. There is a clear need for integrated, rapid, and accurate approaches to respond to the more frequent and complex challenges in contemporary society based on validated data and modern technologies.

Key words*: interferometry, remote sensing, risk management, subsidence, urban planning.*

THE IMPACT OF EXTREME WEATHER PHENOMENA ON THE MANAGEMENT OF CONIFERS STANDS

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Abstract

Coniferous stands are relatively vulnerable to the impact of extreme weather events, often being affected by windfalls, because the spruce species (Picea abies L.) has a trailing root system. As a result, high-intensity winds cause windfalls on compact surfaces and the breaking of tree crowns and trunks. Windfalls in spruce stands also affect the forest soil, on considerable surfaces. The case study was carried out in spruce stands in the Horea Apuseni Forest District, Alba County, which were affected by windfalls and breakages. The objectives of the case study refer to the impact of the extreme weather events of 2011-2017 on spruce stands, forest soil and implicitly on the management of the affected forest unit. The wood affected by these extreme phenomena was valued at a price specific to the assortments and quality of accidental wood products, registering considerable financial losses. Also, a microrelief specific to wind fellings was formed, with an extremely negative impact on the ecological rehabilitation process of the affected spruce stands. The regeneration process of these stands was carried out over a relatively long period, 10-12 years, with very large financial efforts.

Key words*: extreme weather events, spruce stands, forest soil, accidental wood products, ecological rehabilitation.*

INTEGRATING VEGETABLE WASTE IN CLAY COMPOSITIONS: A SUSTAINABLE PATH FOR ECO CONSTRUCTION

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Abstract

Since the dawn of industrialization, technological advancements have progressed rapidly, outpacing the planet`s natural resources` ability to sustain them. In the face of global warming, habitat destruction the imperative to invest in sustainable development practices has become increasingly evident. Clay-based construction materials are gaining traction at the national level, with their benefits recognized for the technical advantages and their contribution to the long-term durability of construction elements. The issue of vegetable waste is a large-scale, multifaceted challenge that continues to grow in urgency alongside rising consumption. Integrating vegetable waste into clay compositions exemplifies how traditional materials can be innovatively adapted to meet contemporary challenges. By combining ancient building techniques with modern knowledge and technology, clay composites can pave the way for a greener construction industry. This sustainable solution not only addresses pressing environmental concerns but also fosters a circular economy where waste becomes a resource. Through such practices, the construction industry can evolve into a model of resilience and sustainability for other sectors to follow.

Key words*: clay composite, sustainable development, vegetable waste.*

INCREASING THE SAFETY LEVEL CONSIDERING SOIL-STRUCTURE INTERACTION IN HIGH SEISMIC HAZARD-PRONE AREAS

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Abstract

The work describes assessments and public policies that would account for safety increase and duration in the exploitation of structures. The level at which the soil-structure interaction is approached in actual normative/codes is highlighted. Proposals for approaching different ways to raise the protection level of structures to be in seismic zones were examined, starting from their location and design; this implies the knowledge of the site seismicity, earthquake-related parameters prediction, the importance of (extended) geotechnical studies, etc. The interaction wave-structure is studied by using the model of harmonic oscillator coupled to an elastic medium. This analysis is meant to be relevant for the effects of seismic motion upon localized structure. Also, the model of an elastic structural element embedded at one end is envisaged and the normal modes and the eigenfrequencies of this independent module are highlighted. The response to oscillating shocks is computed for various ground excitations applied to its base. The response of two coupled modules, viewed as simplified structures thereby harmonic oscillators as well, to an oscillating shock is calculated, and amplification factors are highlighted.

Key words: *localized structures, public policies, risk evaluation, soil-structure interaction, wave-oscillator coupling.*

FLOOD IMPACT ASSESSMENT ON RAILWAY INFRASTRUCTURE USING NUMERICAL MODELLING: CASE STUDY OF NĂDAB, ROMANIA

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Abstract

Railway infrastructure is constantly undergoing processes of change and development; it is becoming an important means of transportation. At European level, railways are going through a period of transformations aimed at increasing the transportation capacity for both goods and passengers, as well as increasing travel speeds. Railway infrastructure is constantly exposed to the action of rainwater, groundwater or extreme weather events such as floods. The problem arises when the water is not quickly drained, it remains for a longer period in the embankments leading to wetting or even saturation of the ground. Soil saturation leads to a decrease in bearing capacity and contributes to soil degradation, compromising infrastructure stability. This paper presents advanced numerical modelling with MIKE11 software of real flood situations in the Năbab area, as well as to assess mitigation scenarios through works on railway infrastructure and land improvement

Key words*: flooding, hazard maps, MIKE11, railway infrastructure, soil saturation.*

WATER RESOURCES MANAGEMENT

EVALUATION OF THE DEGREE OF MICROBIOLOGICAL CONTAMINATION OF GROUNDWATER IN GORJ COUNTY

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Abstract

Gorj County is located in the south-west of Romania with a predominantly mountainous relief, and the main economic activities are specific to the exploitation of natural resources, agriculture and tourism. As a result of the lack of sewerage systems in most of the villages in Gorj County and the uncontrolled storage of manure resulting from animal husbandry activities, the groundwater has suffered significant microbiological contamination. This paper describes the investigations carried out to determine the degree of microbiological contamination of groundwater in the northern part of Gorj County, in one of the most attractive tourist localities. The investigations consisted of taking 45 water samples from public and private wells in the villages of Gureni and Frâncești, in the commune of Peștișani. The most important microbiological indicators for determining water quality were determined from samples: the number of bacterial colonies, the number of coliform bacteria, the number of Escherichia coli and the number of intestinal enterococci.

Key words*: bacteria, contamination, evaluation, groundwater, microbiologic.*

ADAPTING ROMANIA'S IRRIGATION INFRASTRUCTURE TO CLIMATE CHANGE: OPPORTUNITIES AND CHALLENGES

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Abstract

In the context of climate change, where Romania faces increasingly frequent droughts, significantly impacting water availability in several regions, the issue of efficient water resource management is becoming more pressing. The phenomenon of drought is having a growing impact on agriculture, necessitating the development of new irrigation systems and the modernization of existing ones, which may need to be more efficient in water use, such as drip irrigation, subsurface irrigation, or sprinkler irrigation, which can also be equipped with smart irrigation technologies (soil moisture sensors, automatic control, remote monitoring and management, aerial surveillance of agricultural crops, etc.). This study analyzes the opportunities for adapting irrigation infrastructure in the current context, focusing on the possibility of implementing best practices and modern technologies used worldwide in Romania. It also critically examines the challenges Romania faces in the development of irrigation systems, as well as the solutions adopted by other countries to overcome these challenges.

Key words*: climate change, irrigation, water management.*

ECOLOGICAL STATUS ASSESSMENT OF MECHKA RIVER WATER (MARITSA RIVER BASIN)

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Abstract

This study assesses the ecological state of the surface water of the Mechka River from the Maritsa River Basin using the biological quality element macrozoobenthos. Four sampling sites (biotopes) were investigated in autumn 2024 along the Mechka River – 1) near the village of Lenovo; 2) near the village of Poroyna; 3) between the town of Parvomay and the village of Poroyna and 4) before the town of Parvomay. A total of 772 specimens of macrozoobenthos from 36 taxa were identified. The highest number of macroinvertebrate taxa was identified in the second biotope (21 taxa) and the lowest – in the first (14 taxa). The study shows that in three of the four biotopes, macroinvertebrates of Group C (relatively tolerant forms) dominate, whereas in Biotope 3) Mechka River between the town of Parvomay and the village of Poroyna, Group D (tolerant forms) dominates. Basic indices and metrics were calculated according to an established methodology.

Key words*: biological monitoring, ecological status, macrozoobenthos, Mechka River, water quality.*

ECOLOGICAL ASSESSMENT OF THE KAYALIIKA RIVER WITHIN THE MARITSA RIVER WATERSHED USING MACROZOOBENTHOS AS A BIOINDICATOR

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Abstract

The study aims to conduct hydrobiological monitoring of the Kayaliika River (Maritsa River watershed) based on the biological quality element macrozoobenthos. The monitoring was performed following methodologies approved by the European Union and Bulgaria. Macrozoobenthos samples were collected in the autumn of 2024 from four locations (biotopes) along the Kayaliika River near the village of Ezerovo, Bodrovo, Varbitsa and Skobelevo. The number and taxonomic composition of the macrozoobenthos were determined, with the highest number of taxa found in the Kayaliika River biotope near the village of Skobelevo – 28 taxa, and the lowest – in the Kayaliika River biotope near the village of Varbitsa – 12 taxa. Basic indices for species diversity and abundance were calculated. The number of macrozoobenthos taxa by saprobity groups and sensitivity groups from the four biotopes of the studied river ecosystem was presented and compared. The results provide valuable insights into the ecological status of the Kayaliika River and contribute to regional water quality assessments.

Key words*: biological quality elements (BQE), ecological assessment, Kayaliika River, macrozoobenthos, water quality.*

ECOLOGICAL MONITORING OF THE PARVENETSKA RIVER, PART OF THE MARITSA RIVER WATERSHED

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Abstract

This study aims to carry out ecological monitoring of the surface water of the Parvenetska River (Eastern Aegean Sea region, Southern Bulgaria). For the study, samples of macrozoobenthos were collected in the spring of 2024 – a basic biological quality element according to the Water Framework Directive. The taxonomic affiliation of macroinvertebrates was determined, and 26 taxa were identified. The number of EPT taxa, % (Oligochaeta & Diptera), % Filtering feeders, % EPT taxa, German trophic index, and species diversity indices were calculated. As a result of the study, it was established that in the studied biotope, macroinvertebrate taxa of sensitivity group C (relatively tolerant forms) dominate, followed by taxa of group B (fewer sensitive forms).

Key words*: chemical status, ecological state, indices, metrics, river ecosystem.*

ECOLOGICAL ASSESSMENT OF THE BOROVITSA RIVER, EAST AEGEAN SEA BASIN

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Abstract

This study assesses the ecological state of the Borovitsa River, a tributary of the Arda River sub-basin, and the Maritsa River basin using a methodology approved for the European Union and Bulgaria. For the purpose of the study, in the spring of 2024, macroinvertebrates samples were collected from the Borovitsa River near the village of Nenkovo (in the section between Borovitsa Reservoir and Kardzhali Reservoir, according to Bulgarian river typology, this section is classified as R14:"Sub-Mediterranean small and medium-sized rivers" according to the typology of rivers in Bulgaria. The collected macrozoobenthos were taxonomically identified. Fourteen taxa were identified, based on which key ecological metrics were calculated – EPT taxa, Margalef species richness index (Dmg), Shannon-Weaver species diversity index (H'), Pielou's evenness index (E), Simpson's dominance index (C) and biotic index (BI). The findings provide valuable insights into the biodiversity and ecological status of the Borovitsa River, contributing to regional water quality assessments and conservation efforts.

Key words*: biotic index, chemical status, ecological state, macrozoobenthos, Maritsa River basin.*

CONTAMINATION OF POLLUTANTS IN *ABRAMIS BRAMA* (LINNAEUS, 1758), BIOINDICATION AND ECOLOGICAL RISK ASSESSMENT OF THE WETLAND MANDRA-PODA, BULGARIA

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Abstract

The study presents the data on the contamination of Cd, Cu, Hg, Ni, and Pb in the samples of skin, muscles, and liver of freshwater bream (Abramis brama Linnaeus, 1758), as well as in water and sediments samples from the studied ecosystem of the protected wetland Mandra-Poda, Black Sea Region, Bulgaria. Basic ecological indices have been determined. New data for the bioindicator significance of freshwater bream for the accumulation of trace elements in skin, muscles, and liver has been reported. Basic correlation dependencies have been indicated. Discussions on the use of freshwater bream as a food resource have been addressed. The risk of pollution to human health and the environment has been assessed.

Key words*: bioindication, chemical status, ecological state, freshwater bream, risk assessment*.

METAL CONTAMINATION IN THE SYSTEM WATER - SEDIMENTS – *PERCA FLUVIATILIS* LINNAEUS, 1758 AND *EUSTRONGYLIDES EXCISUS* JÄGERSKIÖLD, 1909 LARVAE

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Abstract

The study presents the first data on the accumulation circulation of Al, Ba and Cd in the samples of skin, muscles and liver of the European perch (Perca fluviatilis Linnaeus, 1758), its dominant parasite species Eustrongylides excisus Jägerskiöld, 1909 larvae, water and sediments from the freshwater ecosystem of the anthropogenically affected protected area Mandra-Poda, Black Sea Basin, Bulgaria. The potential of European perch and E. excisus for bioaccumulation towards the studied elements has been studied. The bioindicator significance of P. fluviatilis and E. excisus for assessing the pollution of the freshwater ecosystem with Al, Ba, and Cd has been revealed. The risk to human health and living organisms has been evaluated. Measures for the protection of the ecosystem have been indicated.

Key words*: aluminium, barium, cadmium, bioindication, European perch.*

DRIP IRRIGATION'S INFLUENCE ON CHERNOZEM SOIL: ELECTROPHYSICAL AND SALINITY DYNAMICS

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Abstract

The study of the influence of drip irrigation on electrophysical parameters and water-soluble salt content in soil and strawberry plants (petioles and fruits) under different fertilization systems is presented. The mineralization and pH of the water used to irrigate the strawberries were measured. The increased content of water-soluble sodium cation salts in irrigation water leads to soil salinization (typical chernozem) and an increase in its amount in the thickness of 0-50 cm during the study period. At the same time, the electrical conductivity of the soil-water suspension decreases. Water pH and salt pH tend to change to an alkaline reaction. The highest amount of calcium, sodium and potassium cations is found in the plants of the control variant, the lowest - in the mineral and organic-mineral variants, and the intermediate amount - in the organic system of fertilization with drip irrigation. Adjusting and regularly monitoring the salinity and pH of irrigation water will help grow healthy and beautiful plants, and plant sap analysis complements soil solution analysis.

Key words*: chernozem, drip irrigation, pH, soil conductivity, water-soluble salts.*

WATER USE EFFICIENCY IN IRRIGATED AGRICULTURE IN ROMANIA: OPTIMIZATION STRATEGIES IN THE CONTEXT OF CLIMATE CHANGE

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Abstract

Climate change significantly impacts agriculture, especially in Romania's semi-arid and sub-humid regions, such as Dobrogea, Southern Moldova, and Muntenia. This study analyzes water use efficiency in irrigated agriculture, considering the increase in average annual temperatures and its effect on water consumption. The three irrigation methods – drip, sprinkler, and furrow irrigation – were compared to identify the most efficient strategies. The results indicate that drip irrigation is the most efficient, with minimal water losses and optimized consumption, although high initial costs may pose a disadvantage. Sprinkler irrigation demonstrates moderate efficiency but is influenced by weather conditions, while furrow irrigation has high water losses and low efficiency. In scenarios where temperatures increase by 2°C and 5°C, water consumption for major crops – maize, sunflower, soybean, and sugar beet – increases by up to 25%. The study emphasizes the need to modernize irrigation infrastructure and adopt sustainable technologies to address climate challenges. Financial support for implementing drip irrigation and educational programs for farmers is strongly recommended.

Key words*: adaptation, climate change, evapotranspiration modeling, irrigation efficiency.*

ASSESSMENT OF SURFACE WATER QUALITY ACROSS SELECTED DANUBE RIVER SECTORS BASED ON PHYSICO-CHEMICAL PARAMETERS AND HYDROCARBON LEVELS

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Abstract

This study evaluated the surface water quality of selected Danube River sectors (km 549-990) in the RO13 Cazane–Călărași area using direct field measurements. A multiparameter EXO 2 probe (YSI, USA) was used to analyze key physico-chemical parameters, while hydrocarbon concentrations (Oil in Water and HC micro-g/L) were assessed using PAH probes. Results indicate that most water quality parameters remain within environmental standards, classifying the waters as either "Very Good" or "Good." Temperature (15.03-24.40°C) and pH (7.92-8.36) remained stable, while dissolved oxygen levels (7.01-9.43 mg/L) and chlorophyll concentrations (0.27–1.49 RFU) suggested low risk of eutrophication. Conductivity (262.53-411.56 µS/cm), TDS (207.56-280.80 mg/L), and salinity (0.15-0.21 psu) confirmed freshwater conditions. Turbidity values (2.44-28.75 FNU) and oxidation-reduction potential (-26.59 to 238.79 mV) indicated relatively stable conditions. Hydrocarbon levels (0.03-1.46 mg/L) were within acceptable environmental limits, though localized variations suggested potential pollution sources. These findings emphasize the need for long-term monitoring and transboundary collaboration to address localized pollution concerns and ensure sustainable water management in the Danube Basin.

Key words*: ecosystem monitoring, environmental assessment, hydrocarbon pollution, surface water quality, Danube River.*

ASSESSMENT OF SURFACE WATER QUALITY IN THE SFÂNTU GHEORGHE BRANCH OF THE DANUBE DELTA

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Abstract

The aquatic ecosystems of the Danube Delta are highly vulnerable to ecological pressures caused by natural and anthropogenic factors. This study investigates the surface water quality along the Sfântu Gheorghe Branch, (km85–km15), including control sections such as Mahmudia Meander, Uzlina Lake, Isac Lake, Dunavăț Meander, Dranov Meander, and Ivancea Meander. Surface water samples were collected from 58 locations during spring and autumn (May and September 2024). Physico-chemical parameters were measured in situ using the multiparameter EXO2 probe. Key indicators assessed included water temperature, pH, dissolved oxygen, chlorophyll "a", conductivity, total dissolved solids, salinity, turbidity, and redox potential (ORP). The results revealed generally stable seasonal and spatial trends, with most parameters falling within Class I and II water quality categories, as defined by Romanian Order 161/2006. Noteworthy findings include well-oxygenated waters (>5 mg/L DO), low chlorophyll "a", concentrations (<25 µg/L), and stable pH values, all indicative of good to very good ecological status. Variations in turbidity and ORP were primarily localized and attributed to sediment resuspension or flow dynamics. Overall, the findings suggest that the monitored sections of the Sfântu Gheorghe Branch maintain resilient freshwater conditions, with limited signs of ecological degradation.

Key words*: chlorophyll a, Danube Delta, ecological status, nutrient input, physico-chemical indicators, seasonal variation, Sfântu Gheorghe Branch, surface water quality.*

PHYSICO-CHEMICAL CHARACTERISTICS OF SURFACE WATER SAMPLES FROM THE GORGOVA-UZLINA DEPRESSION AND THE IZMAIL AND SF. GHEORGHE CONFLUENCES (SEPTEMBER–OCTOBER 2024)

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Abstract

The Danube Delta's ecosystems, encompassing riverine branches, lakes, and wetlands, face ecological pressures driven by natural and anthropogenic factors. This study evaluates the physico-chemical characteristics of surface water samples collected in September and October 2024 from 25 locations in the Gorgova-Uzlina Depression and 32 sites near the Izmail and Sf. Gheorghe confluences. Measurements were performed in situ using the EXO 2 multiparameter probe (YSI, USA), which recorded parameters including temperature, pH, dissolved oxygen, chlorophyll "a," turbidity, electrical conductivity, and oxidation-reduction potential. Results indicate that most water samples fall within Class I and II of the Romanian water quality classification (Order 161/2006), reflecting good ecological status. Local variations in dissolved oxygen, turbidity, and chlorophyll "a" suggest potential ecological vulnerabilities, particularly in areas with elevated sediment loads. Conductivity and salinity values confirm the freshwater nature of the investigated sites. The findings highlight the importance of continuous monitoring to assess seasonal and anthropogenic influences on water quality and maintain the ecological integrity of the Danube Delta's aquatic ecosystems.

Key words*: Danube Delta, physico-chemical parameters, surface water quality.*

SPATIAL DISTRIBUTION OF TOTAL ORGANIC MATTER IN RECENT SEDIMENTS OF DANUBE DELTA LAKES (GORGOVA-UZLINA HYDROGRAPHIC UNIT)

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Abstract

Organic matter plays a crucial role in maintaining lake health and trophic balance. It mainly originates from autochthonous sources like phytoplankton, microorganisms, and macrophytes, as well as allochthonous inputs from the surrounding terrestrial ecosystem. Understanding the origin of organic matter is important for assessing ecosystem quality and trends in lake evolution. This study uses the Loss of Ignition method to estimate the distribution, sources, and quantity of total organic matter (TOM %) in lakes of the Gorgova-Uzlina hydrographic unit in the Danube Delta, Romania. Results indicate that TOM concentrations (15-30%) in surface sediments primarily originate from in-situ lacustrine production, with minor contributions from upstream terrestrial inputs. Accomplished analysis revealed recent organo-sedimentary accumulations based on lithological components (TOM %, carbonates-CAR %, and minerogenic fraction-SIL %). The organic matter in these sediments may reflect both natural processes and anthropogenic impacts, emphasizing the need for monitoring to understand the dynamics and vulnerability of the delta ecosystem and perform conservation efforts.

Key words*: areal distribution, lacustrine ecosystems, LOI method, surface sediments, total organic matter.*

IMPACT OF FLOOD DISCHARGE ON WATER QUALITY IN DANUBE RIVER BIFURCATIONS AND SELECTED LAKES (GORGOVA-UZLINA HYDROGRAPHIC UNIT)

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Abstract

Significant progress in water conservation and environmental preservation has been made through efforts by worldwide authorities in ecological water management. However, unexpected water pollution events continue to threaten water quality and biodiversity. Monitoring pollution levels in surface waters is essential for supporting aquatic ecosystem services and sustainability. This study aimed to quantify heavy metal pollution in several sampling sites to assess water quality and its impact on biodiversity. Elements like As, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, and Zn were analyzed using ICP-OES from samples collected during low-water (September 2024) and high-water (October 2024) conditions due to an upstream flood event. Results were compared to Romanian water quality standards. During low-water conditions, heavy metal concentrations were mostly below the limit for Quality Class I, except for Cd, which exceeded this limit. After the flood event, concentrations of most metals were within the Quality Class I limit. Still, Cd, Fe, and Pb showed varied results, with Ni levels ranging from very good to inferior water quality. Continuous monitoring is needed to prevent further degradation of delta ecosystems.

Key words*: concentration, flood event, heavy metal pollution, quality standard, surface water.*

WATER RESOURCE MANAGEMENT IN FRUIT AND VEGETABLE PRODUCTION USING ALTERNATIVE MULCHES

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Abstract

Water management and conservation tillage practices can be important when producing fruit and vegetable crops in areas of limited water resources. This study evaluated six alternative mulching materials - compost, biofilm plastic, newspaper, craft paper, compost with glycerin, and a no-mulch control - against standard low-density polyethylene (LDPE) plastic in a bedded watermelon production system. Three replications of each treatment (mulches) were randomly placed in sections of watermelon rows. Weed density, soil moisture, and temperature were monitored to assess the performance of each mulch. Results showed that all treatments, except for the control and compost, provided effective weed suppression comparable to LDPE. Soil temperature and moisture levels varied across treatments, with compost producing the highest and lowest recorded temperatures. These findings suggest that several alternative mulches, when used in combination with conservation tillage, offer viable, sustainable options for small-scale fruit and vegetable production.

Key words*: alternative mulches, conservation practices, sustainability, water.*

ADVANCED HYDRAULIC MODELING OF IRRIGATION CHANNEL

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Abstract

The Sânnicolau Mare-Saravale Canal covers an area of 20,060 ha, with land rehabilitation works accounting for 19,998 ha. Sânnicolau Mare is located in the western part of Romania, in Timiş County. The MIKE11 program was used for numerical modelling. MIKE11 has flow calculation modules that include hydraulic structures, and ways to describe the operation of the structure. With the MIKE11 model, they draw up flood risk maps. The keywords are productivity, reliability, quality and versatility for professional engineers who use the MIKE11 program. The MIKE11 model has been shown to be highly reliable for generating flood risk maps.

Key words*: advanced modelling, flood maps irrigation channel.*

SEDIMENT TRANSPORT MODELING WITH ADVANCE HYDRAULICS SOFTWARE

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Abstract

This study investigates sediment transport dynamics in the Dognecea River, located in Caraș Severin County using MIKE11. Numerical simulations were conducted to analyze sediment deposition, erosion patterns, and structural interactions. The sediment transport model considers multiple factors, including riverbed sediment characteristics, hydrodynamic conditions, and structural modifications. The sediment transport model has several applications, with variations in parameters such as study objectives, allocated resources, time scale, space, context of the study team, required accuracy, etc. The characteristics of the sediments in the riverbed are a necessary component to know for modeling sediment transport. It is proposed to collect additional sediment samples from the sediments of the layer. The samples obtained will be analyzed according to the size of the particles in the bed. To address sediment transport issues in the Dognecea River, advanced water flow modeling programs are used. Numerical modeling was performed using the MIKE11 software, incorporating hydraulic flow simulations to analyze sediment transport dynamics. Transport models can be used in the case of small alluvium, such as mud or clay, to non-cohesive deposited alluvium, such as boulders, small ballast and sand, but also mixed sediments. MIKE11 provides several options for modeling the movement over time of alluvial transport, as well as structural changes in the riverbed. The results provide insights into alluvial transport behavior and offer solutions for mitigating sediment-related challenges such as riverbed clogging and erosion control. The findings demonstrate the effectiveness of MIKE11 in modeling hydraulic and sediment transport processes, making it a valuable tool for water resource management and flood risk mitigation.

Key words*: bed roughness, hydraulic modelling, sediment transport.*

REMOTE SENSING AND GEOINFORMATICS

COMPIEGNE FOREST, FRANCE BETWEEN HISTORY AND BIODIVERSITY

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Abstract

This paper shows how qGis software can help manage a forest the size of Compiègne by vectorizing its map and overlaying it with the layers needed for management: with forest roads, Natura 2000 declared habitats and soil types. Compiegne Forest compactly covers a relatively flat and uniform plain at an altitude of about 40 m above sea level, with a few hills 120-150 m high, improperly called "mountains". The management of a forest is, both in France and in Romania, the set of concerns and measures designed to ensure that it is brought to and maintained in an appropriate state in terms of the ecological, economic and social functions it fulfils and represents a technological development activity. The Compiègne forest is multifunctional, of great economic importance it produces valuable timber), ecological importance (green space for recreation and sport) and historical importance (15 centuries of existence).

Key words*: biodiversity, ecological function, history, multifunctional forest, soft.*

ENGINEERING AN INTERACTIVE MAP OF STATUES AND MONUMENTS FROM CLUJ-NAPOCA

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Abstract

While the technology in Earth observation and Surveying fields advances, it's possible to learn more information in less time. This research aimed to design a web application that provides useful information about the public monuments from Cluj-Napoca near the user's location. Users can fix their position on the map, define the range of interest, and identify the monuments on the web map. Also, they can find the best route to the touristic objectives, pictures of the monuments, and their history. To achieve this, we first retrieved the coordinates of the statues and monuments using the Mobile Topographer application. We included these coordinates and information about the studied objectives' history and type in a geodatabase. Secondly, we used ArcGIS Pro to obtain information based on the collected data, and a map was created. We created customized scalable icons for each studied monument type. Once data was analysed, it was uploaded into ArcGIS Online as a hosted feature layer based on which a web application was built. This application will be publicly accessible, without conditional on software licenses or the device used.

Key words*: ArcGIS, monuments, Satellite Geodesy, web application*

CASE STUDY ON THE USE OF SCANNING EQUIPMENT UAV IN ORDER TO DRAW UP A MULTIFUNCTIONAL DATABASE, IN CÂRȚIȘOARA LOCALITY, SIBIU COUNTY

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Abstract

The paper presents a case study in which the application of a modern aerial scanning technology with the help of drones is carried out through a specific method, for the creation of a multifunctional database, with a wide applicability in several fields of economic activity and production specific to rural areas, as well as in cadastre real estate advertising works and rural tourism. The choice of the study topic is justified by actuality and necessity, as it contributes significantly to increasing the degree of predictability of the management as a result of the real-time collection of a very large number of data and information, the processing in a short time in order to identify vulnerabilities and their quick and efficient solution, as a result of the increase in knowledge, respectively of minimizing situations of risk and uncertainty. The use of aerial scanning equipment in cadastral works, agriculture, forestry, rural tourism and other important areas for rural development is an activity of great interest and allows to obtain in a short time a large volume of data used for the sustainable development of the community.

Key words*: aerial scanning, drone, multifunctional database, tourism promotion.*

STUDY ON THE IMPACT OF THE APPLICATION OF INFORMATION SYSTEMS ON THE EFFICIENCY AND PRECISION OF TOPO-CADASTRAL WORKS IN THE PREPARATION OF DOCUMENTATION FOR A ROAD IN DOLJ COUNTY

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Abstract

The work was carried out based on the experience of over 30 years of study of the authors' team in the field of land measurements, during which, throughout the specific activities of topography and cadastre, they worked with both classic equipment and high-performance, modern equipment. Based on this, we thought of presenting in this short work, the essence of the experience, which aims to target the impact of modern information systems on all aspects related to topo-cadastral works. A case study was presented for the technical documentation necessary for the tabulation of a road in a locality in Dolj County. As a result, all the advantages and novelties related to the application in topo-cadastral works of the complex information system, consisting of high-performance modern equipment used to collect data from the field, combined with automatic data processing, with a high-performance specialized program, with wide applicability in several fields in Romania. The results were very relevant and significant in terms of their impact on the efficiency, cost-effectiveness and accuracy of the terrestrial measurement work carried out in the presented case study.

Key words*: AutoCAD, documentation, geospatial accuracy, information systems, road registration, topographic measurements.*

HYBRID MODELLING APPROACHES FOR LAND USE/LAND COVER CHANGE PREDICTION AND CARBON DYNAMICS IN MAROWIJNE, SURINAME

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Abstract

Land use changes monitoring and predicting, as well as assessing their impact on carbon storage dynamics, play a pivotal role in addressing environmental challenges and ensuring effective land use management. This study aims to identify land use changes and their impact on carbon storage in the Marowijne district of Suriname from 2017 to 2024 and predict changes for 2034. Sentinel-2 images were used to analyze land change patterns and predict future trends. A hybrid approach combining Markov chain analysis, cellular automata, multilayer perceptron, support vector machines, and logistic regression was used to forecast future land use dynamics, while InVEST and YASSO models were utilized for carbon storage and sequestration predictions. The support vector machine-Markov chain hybrid model achieved an impressive accuracy of over 97%, outperforming other hybrid models. This model is recommended for generating land use change prediction maps, providing a crucial baseline for sustainable land use management. During the subsequent decade (2024-2034), the net loss of high-carbon areas is expected to intensify, affecting 15–20% of the district's territory. The identified spatiotemporal distribution of carbon storage provides valuable insights that will play a key role in achieving the objectives of Suriname's national green development strategy.

Key words: *carbon storage dynamics, hybrid prediction models, land cover change dynamics.*

MONITORING DIFFERENT GRASS VARIETIES USING MULTISPECTRAL IMAGERY BASED ON DIFFERENT IRRIGATION REGIMES

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Abstract

This study analyses the physiological response and visual quality of several grass varieties grown on four experimental plots, using multispectral imaging for monitoring. The control plot did not receive irrigation, while the other three experimental plots were subjected to distinct irrigation regimes: rotors (plot 1), sprays (plot 2), and underground drip irrigation (plot 3). Multispectral data allowed the assessment of vegetative parameters, to analyse the differences in vegetative state and water stress levels between the plots and grass varieties. The results showed significant variations between the experimental plots, depending on both the type of irrigation and the grass variety, highlighting the efficiency of different irrigation systems in both water conservation and maintaining an optimal vegetative state. The study offers valuable insights for optimizing irrigation practices and selecting grass varieties suited to both specific site conditions and the implementation of sustainable maintenance strategies.

Key words*: monitoring, multispectral imagery, remote sensing.*

A GIS-BASED MULTICRITERIA APPROACH FOR IDENTIFYING OPTIMAL REFUGE LOCATIONS FOR SEVERE STORMS: A CASE STUDY IN CLUJ COUNTY, ROMANIA

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Abstract

In recent years, Romania has experienced an increasing frequency and intensity of severe storms, driven by climate change and resulting in amplified weather-related risks such as heavy rainfall, windstorms, and flash flooding. To enhance regional preparedness and support risk mitigation, this study proposes a GIS-based multi-criteria decision-making framework using the Analytic Hierarchy Process to identify optimal locations for severe storm refuges in Cluj County, Romania. Seven spatial factors were selected, consisting of elevation, slope, land use/land cover, population density, and proximity to roads, rivers, and healthcare facilities. Each factor was reclassified and weighted based on expert input and AHP pairwise comparisons, followed by a weighted overlay analysis in ArcGIS. The final suitability map categorizes the county into five classes: not suitable, less suitable, moderately suitable, suitable, and highly suitable. Results indicate that 68.67% of the total area (4569.5 km²) is moderately suitable, while only 0.07% (4.3 km²) is classified as highly suitable for refuge development. The most favourable areas are found near Cluj-Napoca, due to optimal elevation, gentle slopes, built-up and vegetated land cover, and high accessibility to infrastructure and services. This spatial approach offers a replicable model for enhancing disaster resilience in storm-affected regions of Eastern Europe.

Key words*: climate change, disaster preparedness, geospatial data, GIS, hierarchy classification.*

RIVER CORRIDOR CHANGE DETECTION USING SATELLITE IMAGERY AND LIDAR DATA: A CASE STUDY OF THE SIRET RIVER NEAR CORBU VECHI VILLAGE

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Abstract

The evaluation of river course variations, such as bank erosion, sediment deposition, and the influence of nearby human-made structures, is facilitated by the use of remote sensing data and topographic analysis. These changes result from natural events, such as floods, as well as human activities, including the removal of fertile soil, sand extraction, and deforestation. This study highlights the impacts of these changes on river corridor ecosystems, as well as on the infrastructure and properties located along the watercourse. Continuous changes to the Earth`s surface are driven by both natural and artificial factors, which contribute to the erosion, transport, and accumulation of sediments. Among geomorphological agents, flowing water exhibits a particularly high erosive capacity. A primary objective of this study is to identify these changes, with a secondary focus on providing an overview of the current state of river corridors and bank erosion. To achieve this, the research utilizes remote sensing (RS) techniques and geographic information systems (GIS), along topographic data, to effectively monitor and analyze these transformations.

Key words*: change detection, GIS, remote sensing, river.*

ADVANCING CADASTRAL UPDATES AND GIS SPATIAL ANALYSIS FOR FORESTED AREAS

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Abstract

This article explores innovative approaches to improving cadastral systems and utilizing Geographic Information System (GIS) tools for forest management. It emphasizes the importance of accurate and up-to-date cadastral records to support sustainable forest management, land ownership clarity, and environmental preservation. The study outlines methodologies for integrating cadastral updates with advanced GIS spatial analysis techniques, enabling the efficient mapping and monitoring of forested areas. Key applications include assessing land use changes, detecting illegal activities, and planning conservation efforts. The research highlights how GIS tools enhance spatial data visualization, offering insights into forest density, composition, and land-use dynamics. By analysing case studies from forested regions, the article demonstrates practical implementations and benefits, including improved decision-making for policymakers, forest managers and environmental stakeholders. The integration of cadastral updates and GIS-based analysis represents a significant step toward ensuring the sustainable management of forested areas, balancing ecological protection with economic and social considerations.

Key words*: cadastral updates, forested area, GIS.*

ANALYZING THE INFLUENCE OF TEMPERATURE ON NDVI FOR A POTATO CROP IN BRASOV AREA

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Abstract

It is known that meteorological parameters, among others, are highly determinant for the growth of agricultural crops. On the other hand, vegetation indices computed on remote sensing data are widely used for crop monitoring. In this paper we focus on temperature, one of the determinant meteorological parameters, and the Normalized Difference Vegetation Index (NDVI), the most used vegetation index. We use temperature and NDVI time series, the latter one computed based on Copernicus data. Based on the hypothesis that the effect accumulations of temperature in time determines the plant age and growth and, implicitly, its vegetation status, we study the influence of temperature on NDVI and attempt to model it. We present a use case for the monitoring of two potato crops during the 2023 and 2024 seasons in Brasov area, Romania and formulate the conclusions.

Key words*: Copernicus data, NDVI, potato crops, temperature, time series.*

SPATIAL POSITIONING OF TOPOGRAPHIC DETAILS WITH INTEGRATED MODERN TECHNOLOGIES, IN AREAS WITH FOREST VEGETATION

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Abstract

In order to achieve the various objectives related to the sector of terrestrial measurements in areas occupied by forest vegetation, high-performance satellite technologies are currently used. The case study was carried out within the radius of Câmpani, Bihor County, having the objective of analyzing the possibilities of positioning the topographical details, with integrated modern technologies, in areas with forest vegetation. The GNSS receivers Trimble R8, Trimble R10, Trimble R12I, the Trimble S6 total station, as well as real-time data collection and processing software - Trimble Access, were used. The rover-based real-time kinematics (RTK) method was used, with data transmission between receivers via external radio, and framed polygonal journeys. To determine the spatial position of the base points, the data recorded from the permanent GNSS station Beiuș, were used. The data collected were processed in the 2D+1D space, and the results obtained were characterized by superior precision.

Key words*: digital topographical plan, GNSS technology, integrated technologies, spatial positioning, total station.*

ASPECTS RELATING TO THE POSITIONING BY THE SEMI-KINEMATIC METHOD (STOP AND GO) OF DETAIL CHARACTERISTIC POINTS, NECESSARY FOR THE DESIGN OF COMMUNICATION WAYS

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Abstract

The case study was carried out with the help of satellite technologies for the spatial positioning of the various characteristic points of detail in the town of Suiug, Bihor county, and has as its objective the spatial positioning of the points of detail with the GPS system, through the post-processing kinematic method (pseudokinematics) Stop and Go, for the realization of the topographic plans in digital format, and respectively, of the digital models of the land, necessary for the rehabilitation and expansion of the roads in the locality. Trimble R3 receivers were used as base, and Trimble R4 as rover. When recording data from the field, we worked with the Trimble Digital Fieldbook and Trimble Access programs, and the processing with the Trimble Total Control (TTC) program. The coordinates of the base and initialization points of the rover were determined with the Trimble R4 receiver, with information acquired from the Oradea GNSS station, within the ROMPOS system. Mapsys 10.0 and Surfer programs were used to obtain the plan and land model in digital format.

Key words*: digital terrain model, characteristic points of detail, stop and go method.*

FLOOD SUSCEPTIBILITY ASSESSMENT IN THE NERA RIVER BASIN USING GIS: IMPACTS ON LAND USE AND LAND COVER

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Abstract

Floods, rapid and destructive phenomena, significantly impact the environment, including agricultural lands. Geospatial methods for analysis, mapping, and monitoring have been developed over time to identify vulnerable areas. In this context, the present study applies a complex GIS model based on geospatial data, remote sensing data and the Analytic Hierarchy Process (AHP) to determine flood susceptibility in the Nera River basin, located in the southwest of Romania (Caraș-Severin County). The analysis includes nine factors: precipitation, drainage density, elevation, slope, distance to rivers, soils, topography, land use and land cover (LULC) and distance to roads. The results are synthesized into a susceptibility map, classified by risk levels and correlated with LULC to evaluate the impact on agriculture. Theoretically and practically, such models are essential for preventing and managing the effects of floods and for implementing optimal measures in line with sustainable development principles

Key words*: agricultural land, flood susceptibility, GIS models, impact, watershed.*

SPATIAL POSITIONING WITH COMBINED METHODS OF TOPOGRAPHIC POINTS NECESSARY FOR ACCESSIBILITY OF FORESTS IN MOUNTAIN AREA

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Abstract

Since in the mountain area the area occupied by forest is over 60% of the area of the national forest fund, making forests accessible is an obvious necessity for the sustainable management of various forest resources. The research was carried out within the III Galbena production unit, Sudrigiu Forest District, within the scope of the Bihor Forestry Directorate, with the objectives of applying combined methods of spatial positioning of topographical details, necessary for the design and construction of transport facilities, in the perspective of making 15 inaccessible stands accessible, on an area of 174.48 ha. For the positioning of the topographical details, GNSS technology, GPS system and total station were used, and the working methods used are represented by real-time kinematic positioning (RTK), combined with polygonometric mapping framed with erasures, carried out with the total station. The use of modern combined methods for positioning topographic details in the inaccessible forest fund in the mountain area ensures the obtaining of products in alphanumeric and digital format with superior precision, necessary for the design and construction of transport installations in optimal technical conditions.

Key words: *combined technologies, contour lines, digital terrain model, forest accessibility, GNSS technology, spatial positioning.*

ASSESSMENT OF LAND USE CHANGES IN NON-COLLECTIVIZED AREAS USING GEOMATIC APPLICATIONS: A CASE STUDY IN VÎRFURILE, ROMANIA

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Abstract

After 1990, land use categories in non-collectivized hilly and mountainous areas experienced distinct changes, influenced by various socio-economic and environmental factors. This study focuses on cadastral sector 15 within the administrative territorial unit of Vîrfurile, Arad County - an area that was not subjected to collectivization. The objective is to analyze the current state of land use categories using geomatic applications. Plot localization was achieved using orthophotoplans, while spatial positioning was conducted via GNSS technology employing the Real-Time Kinematic (RTK) method, with data transmission between receivers facilitated by internal radio. Base point coordinates were determined using data from the GNSS station in Gurahonț. The coordinates of the characteristic detail points were processed with the MapSys10 software and overlaid onto the orthophotoplan. Analysis of the results reveals that several plots formerly designated for agricultural use are now partially covered by arboreal forest vegetation, indicating a significant process of natural succession and land use transformation.

Key words: *geomatic applications, GNSS technology, land use categories, non-collectivized areas, spatial positioning*.

TECHNICAL METHODOLOGIES FOR CADASTRAL PLAN DEVELOPMENT USING GNSS AND UAV TECHNOLOGIES: A CASE STUDY IN PIETROASA, ROMANIA

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Abstract

The realization of the cadastral plan for administrative territorial units involves field activities, the identification of owners and neighbors, the identification and spatial positioning of plots, and the verification of the category of use. The case study was carried out within the administrative territorial unit Pietroasa, Bihor County, and aims to analyze the technical aspects related to the realization of the cadastral plan of cadastral sector 31. For the identification of the cadastral sector and the plots, a drone flight was carried out, thus obtaining an orthophotogram of the respective location. The spatial positioning of the detailed topographic points related to the plots was carried out with GNSS technology, GPS system, using the RTK method, based on the GNSS station Beiuș. The reporting of the coordinates of the characteristic points of detail, and the preparation of the cadastral plan in digital format was done with the program MapSys 9.0. In the end, a total of 652 plots were reported in Cadastral Sector 31. By using the above-mentioned logistics and working methods, a high degree of automation and superior positioning accuracy was achieved.

Key words*: cadastral plan, cadastral sector, plots, land use categories, GNSS technology, GPS system.*

ACCURACY IN VERTICAL ASSESSMENT OF TELECOMMUNICATIONS TOWERS THROUGH 3D SCANNING

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Abstract

Telecommunications towers are essential infrastructures that serve various functions, including telecommunications, meteorological data collection, and surveillance. Maintaining their structural integrity and accurate vertical alignment is crucial for ensuring operational efficiency, safety, and long-term durability. However, evaluating the verticality of tall structures presents significant challenges, necessitating the use of modern and precise methods. Traditional techniques, such as manual surveys using level instruments, are often limited by human error, environmental factors, and the complexity of the structures involved. This study investigates the use of LiDAR (Light Detection and Ranging) technology as a modern method for assessing verticality. By employing advanced LiDAR scanning techniques, the research establishes a thorough framework for accurate and efficient structural monitoring. The paper highlights how LiDAR technology outperforms traditional methods in accuracy, speed, and flexibility, providing a safer and more dependable solution for managing the vertical alignment of observation towers.

Key words*: 3D scanning, LiDAR, point cloud, surveying accuracy, vertical assessment.*

APPLICATION OF HIGH-RESOLUTION SATELLITE IMAGERY FOR EVAPOTRANSPIRATION ESTIMATION - A SCIENTIFIC REVIEW

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Abstract

The use of remote sensing technology can facilitate the acquisition of data pertaining to crop evapotranspiration, which can in turn inform precision irrigation practices. This is achieved through the analysis of satellite image data. The acquisition of accurate information regarding the utilisation of water is of significant importance within the domain of agricultural water management and crop production, particularly at the scale of human impact on the natural water cycle, in the context of global climate change and the increased prevalence of droughts. The objective of this study is to investigate and provide a summary of the potential for using satellite imagery and in situ measurements for meteorological factors, crop vegetation and soil water content, with a special focus on the assessment of evapotranspiration. The studies conducted are of significant value in predicting the potential water requirements of plants, the capabilities of irrigation systems and the efficient utilisation of irrigation water in agriculture through the implementation of adaptive irrigation regimes.

Key words*: evapotranspiration, irrigation, satellite imagery, vegetation indices.*

INTEGRATING UAS, LIDAR, AND GROUND-BASED SURVEYING FOR PRECISE DEMOLITION VOLUME ASSESSMENT: A CASE STUDY OF THE DOLJ CHIM INDUSTRIAL COMPLEX

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Abstract

This study presents a case analysis of an integrated surveying and mapping initiative conducted at the Dolj Chim Industrial Complex in Romania, with the primary objective of determining material volumes expected from impending demolition activities. Employing a multi-faceted approach, the research combined data acquisition using a handheld LiDAR system for the interior and UAS equipped with high-resolution imaging sensors for the exterior. These complementary datasets were georeferenced using ground control points collected via GNSS receivers and Total Station measurements, ensuring a consistently accurate and spatially coherent representation of the site. This integrated approach streamlines data management and enhances the utility of subsequent analyses. The results emphasize the significance of selecting and integrating appropriate surveying technologies tailored to the complexities of industrial environments. By leveraging the strengths of various methods, high-density interior scanning and external imaging, reinforced by reliable ground-based control, the study achieves an enriched and precise dataset conducting to informed decision-making in demolition planning. Beyond its immediate relevance, this approach demonstrates broader applicability in complex geospatial contexts and best practices for harmonizing sensor technologies and conventional surveying techniques.

Key words*: 3D scanning, LiDAR, point cloud, surveying accuracy, UAS, volume assessment.*

INVESTIGATION BETWEEN VEGETATION INDICES, METEOROLOGICAL DATA AND PHENOLOGY OF WINE GRAPE VARIETIES

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Abstract

The successful cultivation of vines must be aware of the phenological phases during the growing season. However, conventional phenological measurements on the ground are limited due to their spatial coverage. The use of Sentinel-2 imagery has led to an increased interest in its application to viticulture, with the data providing access to global spatial coverage and the potential for high temporal resolution. The present study was conducted during the period 2021-2022 in the experimental vineyard of the Agricultural University of Plovdiv, with the aim of studying the phenological phases of the wine grape varieties Merlot, Mavrud and Chardonnay. The results will enhance the interpretation of the spatiotemporal dynamics between meteorological data, vegetation indices (Normalized Difference Vegetation Index Normalized Difference Vegetation Index -NDVI), and phenological stages in vine cultivation. This study highlights the effectiveness of remote sensing for monitoring vineyard phenology, both retrospectively and in real time, as a valuable tool for maintaining high-quality standards in precision viticulture

Key words*: grape varieties, meteorological data, NDVI, phenological stages.*

APPLICATIONS OF HYPERSPECTRAL SPACEBORNE REMOTE SENSING IN AGRICULTURE

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Abstract

Hyperspectral (HS) satellite remote sensing is transforming agricultural research by providing unparalleled spectral resolution compared to traditional multispectral (MS) sensors. HS instruments capture data across contiguous, narrow spectral bands, enabling the detection of subtle biochemical, structural, and phenotypic variations in vegetation. Unlike MS imaging, which is limited by broader bands and fewer channels, HS imagery offers enhanced precision in differentiating species, monitoring stress, and quantifying geophysical parameters, even under complex environmental conditions. Hence, HS remote sensing opens new perspectives for agricultural applications, e.g. detecting plant stress and nutrient imbalances, or reducing environmental impacts from over-fertilization. Additionally, HS sensors excel at separating crop species, weeds, and pests using finer spectral features, and model growth trends more accurately for improved crop yields forecast. The paper provides a comprehensive review of the state-of-the-art advances regarding precision agriculture, crop monitoring, and sustainable resource management from recent studies and the ongoing Horizon Europe EXPERT project (ID 101160059), led by the Romanian Space Agency in partnership with the Italian and German Space Agencies, where agriculture is among the main cases of study considered.

Key words*: agriculture, crop yield, hyperspectral remote sensing, plant stress, spectral resolution.*

THE EFFECTS OF APPLYING THE LAW IN CADASTRE ACTIVITY – A COMPARATIVE STUDY OF THE RESOLUTIONS THAT CAN BE ADOPTED FOR THE REGISTRATION OF REAL ESTATE PROPERTIES IN THE LAND REGISTRY

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Abstract

Starting from the statement `A good cadastre of the parcels will be the complement of my civil code, the fundamental importance of the cadastre in the management of land and real estate properties becomes evident. It provides a detailed and up-to-date record of land parcels, including their owners, describing the boundaries and characteristics of each property. Through this, the cadastre facilitates the implementation and adherence to legal norms regarding property rights and their transfer. In the context of societal development and evolution, a well-maintained cadastre becomes an essential tool for urban planning, natural resource management, and infrastructure project implementation. Furthermore, a modern cadastre system can help prevent legal disputes related to property and serve as a crucial instrument in urbanization and economic development processes. An efficient cadastre is not only a technical necessity but also a fundamental element for the functioning of a coherent legal system and for responsible real estate management, contributing to the establishment and maintenance of a cohesive societal structure.

Key words*: collectivization, legislative changes, possession, property rights, real estate.*

DETERMINATION OF LAND VALUATION FACTORS FOR THE PROCESS OF LAND CONSOLIDATION - A CASE STUDY IN SASCHIZ ADMINISTRATIVE UNIT IN ROMANIA

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Abstract

Land fragmentation is a phenomenon that affected Western Europe in the past and, starting from 1989, the countries of Eastern Europe. One of the ways in which the effect of land fragmentation can be diminished is the process of land consolidation. Through land consolidation, owners can get better shaped parcels that can help increase agricultural productivity. Using the existent literature in the field of land consolidation, this exploratory study proposes a series of factors for land evaluation for the land consolidation process. These factors are applied in Saschiz administrative unit in Romania using different type of data to calculate the score for each factor. The result shows how this framework functions in real conditions.

Key words*: cadastre, operations, processes, systematic land registration.*

THE APPLICABILITY OF GIS TECHNOLOGY IN THE STUDY OF RIVERBED DYNAMICS AND MORPHOLOGY

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Abstract

This study presents the research findings on the geomorphological conditions of representative gravel extraction sites along the Moldova River and evaluates the impact of riverbed material extraction on the stability of the riverbed and its sediment regeneration rate. The analyzed sector spans approximately 26 km, covering the stretch of the Moldova River between Păltinoasa and Cornu Luncii in Suceava County, with a focus on the Capu Câmpului extraction site. The intensity of gravel extraction activities is evident in the variations of suspended sediment hydrographs, which show an increasing trend over time in the Moldova River, contrasting with the general decreasing trend observed in other rivers of the Siret Basin. By employing GIS techniques through orthophotoplans and ArcGIS 9.2 software (via Digital Elevation Model creation), calculations were made for the volumes of mineral aggregates potentially extractable between 2017 and 2021.

Key words*: extraction, GIS techniques, riverbed.*

AN EXAMPLE OF LAND CONSOLIDATION IN SASCHIZ ADMINISTRATIVE UNIT FROM ROMANIA

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Abstract

Land fragmentation is one of the biggest problems that countries in Eastern Europe faced after the fall of communism. Romania has been the most affected country by this phenomenon. Land consolidation is a process that counters the effect of land fragmentation by relocating and reallocating land. The research is an experimental study that, with the help of land consolidation software, reallocates and rearranges parcels of land in order to obtain parcels that are better shaped and can ensure superior agricultural productivity. Following the land consolidation process, the number of parcels for every owner is reduced, while the average surface of every owner increases.

Key words*: land consolidation, land fragmentation, GIS, systematic registration.*

MISCELLANEOUS

VIRTUAL LABS IN ENGINEERING EDUCATION: ENHANCING LEARNING OUTCOMES

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Abstract

This study examined the efficacy of blended learning in an engineering course by integrating virtual laboratories, designed with an emphasis on inquiry-based learning and gamification, with traditional in-person sessions. Students reported increased confidence in understanding theoretical concepts when using virtual laboratories. Furthermore, engagement with the virtual labs correlated with improved academic performance, as evidenced by higher median test scores. These findings highlight the potential of virtual laboratories to enhance learning outcomes in engineering education by offering increased accessibility, enriched content, and a safer learning environment. Virtual labs provide flexible, accessible, and engaging opportunities that contribute to the sustainable development of higher education.

Key words*: active learning, blended learning, learning achievement, students' perceptions, virtual labs.*

CLIMATE CHANGE, A MAJOR CHALLENGE FOR THE BALANCE OF MICROSYSTEMS

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Abstract

Climate change, a consequence of the increase in the concentrations of greenhouse gases, significantly affects microclimatic characteristics at the local and regional levels. The purpose of this paper is to investigate and analyze the effects of this worrying global phenomenon on microclimatic parameters such as air temperature, relative humidity, wind speed, and solar radiation, as well as their interactions with terrestrial ecosystems, addressing the direct and indirect effects on local biodiversity and investigating possible strategies adaptation to maintain ecological stability on a small scale. The study focuses on a specific agricultural region in the Balkan area of Europe, more specifically the south-eastern area of Romania which has become a new point of interest sensitive to climate change, where these changes directly affect biodiversity, agriculture, and natural resources. water. The work presents the data of the evolution over time during the years 2019-2022 of the climatic parameters, through observations and meteorological records. It observes recent trends and projects' long-term impacts.

Key words*: biodiversity, ecosystem, natural resources.*

FIBONACCI'S SEQUENCE IN NATURE, SCIENCE AND ARTS. THE GOLDEN RATIO

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Abstract

Leonardo Fibonacci (c. 1170 – c. 1240-1250), an Italian mathematician often regarded as the most gifted European mathematician of the Middle Ages, played a crucial role in introducing the Hindu–Arabic numeral system to Europe. His seminal work, Liber Abaci (1202), not only promoted this numerical framework but also featured the now-famous Fibonacci sequence - an integer series with deep mathematical properties and widespread applications. This paper explores the mathematical foundations of the Fibonacci sequence, including its recurrence relations, algebraic and matrix representations, and connections to continuous fractions. Furthermore, it examines the relationship between the sequence and the golden ratio (φ), an irrational number often referred to as the "divine proportion". The golden ratio is linked to aesthetically pleasing proportions and appears in various domains such as art, architecture, music, biology, and cosmology. Through historical analysis and illustrative examples, this work highlights the enduring influence of Fibonacci's legacy and the remarkable intersection between mathematical theory and patterns observed in the natural and cultural world.

Key words*: Fibonacci sequence, golden ratio, recursive functions, mathematical modelling, patterns in nature.*

STUDIES SUPPORTING THE DESIGNATION OF A NEW NATURA 2000 SITE: BAHNELE BANCULUI NORD

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Abstract

The Bahnele Bancului peatlands, located in Suceava County, were selected for restoration due to multiple threats, such as habitat degradation, overgrazing, and drainage.The peatland currently faces an unfavourable conservation status, with Picea abies trees, over 80 years old, being the dominant vegetation. By integrating national moss species surveys with ongoing peatland restoration efforts, local research has been significantly supported. Field assessments conducted between 2022 and 2023 revealed valuable species and habitat data. Buxbaumia viridis (Moug. ex Lam. & DC.) Brid. ex Moug. & Nestl., a key moss species that serves as an indicator of well-preserved spruce forests and protected by the EU Habitat Directive, was identified on the site in June 2022. In addition, priority habitats, such as 91D0 Bog Woodland were observed, with notable species such as Sphagnum spp., the rare orchid Epipactis helleborine, and the Carpathian newt (Lissotriton montandoni). These findings have contributed to the completion of the Natura 2000 site designation forms, which include detailed habitat and species data along with a map, highlighting the site's importance for conservation.*

Key words*: bog woodland, bryophytes, threatened species.*

PRELIMINARY BIODIVERSITY SURVEY IN A NEWLY PROPOSED SITE OF COMMUNITY IMPORTANCE: THE AVRIG PEAT BOG

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Abstract

Peatland habitats are well-known for their function in sequestering carbon, characterized by peat-forming species such as Sphagnum mosses. The Avrig peat bog, located at the foothills of the Făgăraș Mountains in the Olt River basin, is a small site (less than 4 hectares) proposed for designation as a Natura 2000 site. A eutrophic palustrine zone encircles the peat bog`s center oligotrophic zone, dominated by Sphagnum mosses. This area is characterized by the presence of the European-protected priority habitat Active raised bogs (habitat code 7110). We employed a combination of field surveys and aerial investigations to assess the site`s biodiversity and evaluate potential threats. The collected Sphagnum samples were morphologically examined in the laboratory, revealing several species, like Sphagnum medium Limpr., Sphagnum capillifolium (Ehrh.) Hedw. and Sphagnum girgensohnii Russow. The bog also supports rare plant and amphibian species of conservation interest. Targeted management strategies are necessary to mitigate pressures including agricultural runoff, drainage, invasive species, and peat extraction.

Key words*: amphibians, Natura 2000, peatland restoration, raised bogs, rare plant species, Sphagnum.*

RESTORATION ACTIVITIES AND BIODIVERSITY SURVEY OF WEST STUPINI MIRE IN THE BÂRSA DEPRESSION: BASELINE FOR NATURA 2000 CONSERVATION

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Abstract

The Stupini Mire, proposed as a new Natura 2000 site, is a wetland located in Romania's Bârsa Depression. The site hosts a diverse range of habitats, including alkaline fens (7230), calcareous fens (7210), Molinia meadows (6410), hygrophilous tall herb communities (6430), and alluvial forests (91E0*). This study highlights the ecological importance of the mire and evaluates the impact of recent restoration efforts. Vegetation surveys conducted between 2022 and 2024 confirmed the presence of rare and protected species, such as Swertia perennis and Primula farinose as well as the glacial relict Ligularia sibirica, a species protected under European legislation. However, the rare orchid Liparis loeselii was not detected, raising concerns about its possible local extinction due to drought and habitat degradation. To counteract these threats, restoration efforts focused on reestablishing the hydrological balance and removing invasive species. These measures resulted in a notable increase in the water table, with levels rising by up to 10 cm. The findings underscore the urgency of continued conservation efforts and formal designation of the site under Natura 2000 to prevent further biodiversity loss.*

Key words*: anthropic pressure, biodiversity conservation, climate change, invasive species, rare species.*

INDOOR IoT SEEDLING NURSERY DEVELOPMENT

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Abstract

In recent years, indoor plant cultivation has become an increasingly popular hobby. However, the natural environment required for optimal plant growth is not universally available, and therefore, it is necessary to replicate the missing environmental factors. Successful cultivation can be greatly enhanced by monitoring and adjusting environmental conditions. By collecting and analysing environmental data, it is possible to set appropriate parameters and optimize the operation of an environmental control system. This system requires sensors and actuators to compensate for environmental deficiencies and automate relevant processes. If the system's parameters are flexible enough, it can support the growth of a wide range of plant species. An effective approach to achieve this flexibility is through an online interface that allows remote access and enables the display of measured data as well as the adjustment of control parameters. A microcontroller-based system can be employed to manage this process. This paper outlines the hardware and software architecture, describes the communication protocols used, and provides an analysis of the system's expected performance.

Key words*: controlled environment, indoor planting, IoT.*

CHANGES OF PLANKTON COMPOSITION IN WINTER CONDITIONS IN AN URBAN LAKE

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Abstract

The winter season, characterized by unfavorable conditions for aquatic biota, determined by low temperatures, instigates a series of ecological shifts that intricately shape the phytoplankton and zooplankton communities' structure and function. Our study in Văcărești Lake focuses on the effect of the winter season on plankton communities, highlighting structural and functional changes in these communities. During the winter, environmental parameters significantly changed indicating organic matter decomposition and eutrophic conditions. The winter conditions functioned as ecological stressors on plankton communities. Phytoplankton responded by changing composition, with green algae and diatoms becoming prominent as cyanobacteria declined. Zooplankton, especially Rotifera and Cladocera, showed increased diversity and abundance, while Ciliata and Copepoda decreased. The RDA analysis highlighted phytoplankton's responsiveness to TDS, conductivity, turbidity, pH, and zooplankton's correlation with oxygen and temperature. The Diversity t-test indicated significant changes in both phytoplankton and zooplankton communities in terms of diversity. Zooplankton diversity was higher than phytoplankton, with moderate species composition changes, reflecting cold-tolerant species development and the ecosystem's resilience and adaptability to winter conditions.

Key words: *abundance, cold-season changes, phytoplankton, Văcărești Natural Park, zooplankton structure.*

VEGETATION SURVEYS FOR MONITORING CO_2 GEOLOGICAL STORAGE SITES: A CASE STUDY FROM TWO ANALOGUE SITES FROM ROMANIA

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Abstract

Carbon capture and storage (CCS) is a promising solution for reducing carbon emissions, but the risk of CO_2 leakage requires monitoring. As part of project PN 23300404, we aim to develop an environmental monitoring methodology for onshore geological storage sites, evaluating vegetation surveys as a monitoring tool. In 2024, we conducted combined vegetation and geochemical surveys at two sites: Bodoc, an analogue for safe storage, and Băile Lăzărești, an analogue for CO_2 leakage. Using a grid-based sampling approach, we measured soil-flux and concentrations alongside floristic observations. At Bodoc, no significant relationship was observed between CO_2 levels and vegetation state. In contrast, at Băile Lăzărești, areas with high CO_2 concentrations had sparse vegetation and exposed soil, though these features were also present in some low-CO_2 areas due to landscaping. Follow-up surveys are planned for next year to determine the natural variability of the vegetation. Currently, we conclude that vegetation surveys have the potential to be used for leakage identification.

***Key words**: CO_2 geological storage, monitoring, natural analogues, soil flux, vegetation surveys.*

ANALYSIS OF DIAMETER AND HEIGHT GROWTH OF SCOTS PINE SAPLINGS PLANTED IN 2023 ON THE STERILE DUMPS OF RECEA ȘUNCUIUȘ QUARRY, BIHOR COUNTY

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Abstract

This study evaluates the success of Scots pine sapling plantings conducted in 2023 on the waste deposits at the Recea Șuncuiuș Quarry in Bihor County. Four experimental plots were established, divided into two slope categories. Half of the saplings received fertilizer, and for all saplings, survival rates were assessed, along with measurements of diameter and height growth. The findings indicate no significant differences in sapling growth between the slopes, and the application of fertilizer did not notably affect their development in the first year after planting. However, in the second year, significant changes were observed. The slope became a negative factor, while fertilization had a significant positive impact on growth in terms of diameter and height, particularly under the harsh conditions of the exceptionally dry and hot summer of 2024.

Key words*: diameter, height, pine, Pinus, survival rate.*

EUROPEAN UNIVERSITY STUDENTS' ATTITUDES TOWARD THE EUROPEAN GREEN DEAL: A COMPARATIVE STUDY

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Abstract

The attitudes of students toward the European Green Deal were assessed through a survey involving master's and doctoral students from four European universities: Universitat Autònoma de Barcelona (Spain), University of Porto (Portugal), University of Agronomic Science and Veterinary Medicine of Bucharest (Romania), and Uzhhorod University (Ukraine). Results revealed strong overall support among students for actions promoting environmental sustainability and reducing carbon footprints. Significant variations were observed across countries, with students from Spain, Portugal, and Romania demonstrating particularly high agreement regarding the importance of balancing economic growth with environmental protection. While respondents generally recognized the long-term benefits of the Green Deal, concerns regarding implementation costs were notably higher among students from Romania and Ukraine. Additionally, a vast majority expressed interest in tools to monitor personal carbon footprints, highlighting growing awareness of individual environmental responsibilities. These findings suggest a positive attitude among European university students toward environmental sustainability initiatives, though addressing concerns about economic implications could enhance broader support.

Key words*: comparative study, environmental sustainability, European Green Deal, higher education, students attitude.*

DISRUPTION OF THE GLOBAL WATER CYCLE - AN URGENT CALL FOR ACTION FROM A ONE HEALTH PERSPECTIVE ON HUMANITY'S FIRST HISTORICAL IMPACT

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Abstract

The One Health framework underscores the interdependence of human, animal, and environmental health. This article investigates the significant disruptions to the natural hydrological cycle resulting from human activities and examines the ramifications for public health, ecosystem resilience, and agricultural sustainability. Additionally, it delves into the complex interrelationship among water resource management, climate change, and ecosystem health within the One Health paradigm, highlighting the necessity for a collaborative, multi-sectoral approach to effectively tackle these challenges. As humanity transitions into a new geological epoch, referred to as the Anthropocene, it is vital to comprehend the impacts of our practices on the water cycle to mitigate future health hazards and encourage sustainable development initiatives.

Key words: *disruption of natural water cycle, future health risks, implications in public health, sustainable practices.*

DIMENSIONING OF UNDERGROUND PIPE NETWORKS OF IRRIGATION PLOTS. CASE STUDY - FANTANELE - SAGU IRRIGATION PLOT, ARAD COUNTY

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Abstract

To ensure the realization and efficient technical and economic operation of an irrigation system, it is important that, from the design, a correct dimensioning of the network of underground sprinkler irrigation pipes and, respectively, of the pressure station to ensure the necessary flow and pressure on all sections of the network, starting from the calculation of the irrigation regime, is ensured. The paper presents a calculation model for the correct dimensioning of the network of underground pipes within an irrigation plot, applied to the case study of the Fantanele - Sagu plot, Arad County, which takes into account the determination of the diameter of the main, secondary pipes and the antennas in such a way as to ensure the transport of the necessary water flow in each point of the plot and respectively to ensure the pressure necessary for the operation of the mobile watering equipment at all existing hydrants on this network. In the case study, the project for the modernization and retechnology of the secondary irrigation infrastructure is presented of the SPP Fantanele - Sagu plot.

Key words*: antennas, hydrants, irrigation, pipe network.*

THE DEGREE OF THE ROOTING AND ADAPTABILITY OF CORMOFLORA ON THE WASTE DUMPS OF THE BAIA NOUĂ QUARRY (MEHEDINȚI COUNTY)

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Abstract

The studied area includes the former Baia Nouă quarry mining, which belongs to the commune of Dubova, Mehedinți county, an integral part of the Banat Mountains. As part of this work, we tried to carry out an ecological rehabilitation study of the area where all mining operations have been closed for a very long time, the Baia Nouă quarry mining is a ruin, here you can find waste and garbage resulting from the abandonment and degradation of the administrative buildings in the quarry. In order to achieve a good rehabilitation of this area, we took into account the type of native vegetation existing here and in the immediate vicinity, in order to avoid fragmentation of habitats, as well as the existence of an obvious `desire` of some species to establish themselves and conquer new territories in this area.

Key words*: adaptability, Baia Nouă, cormoflora, quarry, waste dumps.*

EXPERT PERCEPTIONS ON DIGITAL EDUCATION TOOLS AND ASSESSMENT STRATEGIES UNDER THE EUROPEAN GREEN DEAL FRAMEWORK

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Abstract

This study investigates expert opinions from five universities across Romania, Spain, Portugal, and Ukraine regarding the use of digital learning, gamification, and artificial intelligence (AI) in enhancing education aligned with the European Green Deal (EGD). Based on structured survey responses from academic professionals, the findings reveal that 65% of participants view online learning as a potential contributor to social isolation, highlighting the value of blended learning approaches. Gamification received broad support, with over 70% of experts agreeing it improves student engagement and comprehension, although concerns about cost and implementation persist. AI was acknowledged as a valuable tool for academic integrity and assessment, though its effectiveness in providing real-time personalized feedback remains inconclusive. These results suggest that a balanced integration of digital tools can support improved educational outcomes and better understanding of sustainability-related content.

Key words*: artificial intelligence, European Green Deal, gamification.*

ATTITUDES OF EUROPEAN GRADUATE STUDENTS REGARDING THE ROLE OF ADVANCED TECHNOLOGIES IN ENERGY AND INDUSTRY FOR A GREEN ENVIRONMENT IN THE CONTEXT OF CLIMATE CHANGE AND THE EUROPEAN GREEN DEAL

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Abstract

This study explores the attitudes of European students towards the role of advanced technologies in energy and industry in fostering a green environment, particularly in the context of climate change and the European Green Deal. Survey results highlight a strong recognition of the importance of sustainability-related knowledge, including topics such as Green Agriculture, Zero Pollution, Circular Economy, and Green Sustainable Energy. The findings suggest that while students across Europe acknowledge the transformative potential of advanced technologies in achieving environmental goals, national contexts and current events, such as the ongoing conflict in Ukraine, influence perceptions of climate-related education and policy priorities. The survey results underscore the importance of incorporating green technologies into academic curricula to support the objectives of the European Green Deal.

Key words*: European Green Deal (EGD), green technology, sustainability education, zero pollution.*

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