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

2023
Bucharest

University of Agronomic Sciences
and Veterinary Medicine of Bucharest

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THE USEFULNESS OF THE STRUCTURAL SOIL FOR THE DEVELOPMENT OF TREES IN URBAN AREAS

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Abstract

In urban conditions, a decrease in the condition of mature stands is noticed, and the lifespan of newly planted trees becoming shorter. According to that it becomes necessary to develop solutions - make new plantings more effective by testing suitability of structural soil for trees in urban areas. The study was carried out in experimental area with four types of substrates: structural soil (a mixture of broken stone and soil substrate), soil found in the study area (control sample), heavily compacted soil (simulating urban soils), and a mixture of soil and rubble (very difficult urban conditions). Eight Tilia tomentosa were planted in each substrate. Six years after, during the growing season (spring, summer, autumn), the effect of the substrate in which tree grows on the photosynthetic process (fluorescence of chlorophyll: Rc/CS0, FV/FM, PIABS indices) was analysed. The best results of the tested parameters were obtained by the control sample. When it is necessary to interfere with the substrate, which is difficult to avoid in urban conditions, structural soil is effective solution for ensuring appropriate conditions for tree development.

Key words*: chlorophyll-a fluorescence, habitat conditions, soil compaction, stress factors.*

MONITORING OF "DEALUL MARIA" MARBLE PERIMETER, RUSCHIȚA, CARAȘ-SEVERIN COUNTY

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Abstract

Soil excavation represents a fundamental step in the construction and development of infrastructure. Despite the widespread application of best practices and regulations, accidents in the construction industry are comparatively higher than those in other industries. Deep excavations have the potential to cause adverse effects on the stability of the soil and nearby structures. Thus, in addition to ensuring safety, it is necessary to assess and monitor the environmental impact of deep excavations during construction processes. An eloquent example is represented by monitoring the marble resources exploitation from the quarry located in the "Dealul Maria" perimeter, in the town of Ruschița, through topographical surveys realized with a view to determine volumes, carried out quarterly, for a period of 5 years. The achieved 3D modelling highlights the differences between the initial shape of the natural land before the start of exploitation, the resulting shape of the land at different stages of the exploitation and the final shape as well as supports a proposal to green the exploited area by restoring the exploited land to a form as close as possible to the original one.

***Key words**: BIM, 3D modelling, deep excavations, environmental impact, topographic survey.*

5 METHODS OF DETERMINING THE CHARACTERISTIC VALUES OF SHEAR STRENGTH PARAMETERS

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Abstract

The shear strength parameters, internal friction angle (φ [°]) and cohesion (c [kPa]), represent derived values, according to the methodology of Eurocode 7 and NP 122. They are determined by processing the pairs of normal stress (σ) - tangential stress (τ) values resulted from direct shear or triaxial compression tests. The paper presents 5 methods of determining the characteristic values, following the direct processing of φ and c values or indirectly, by processing pairs of σ-τ values, resulted from direct shear tests. The characteristics values of shear strength parameters are required for the geotechnical design in the case of various geohazards and for foundation solution. A series of conclusions are drawn based on the legislation in force.

Key words*: characteristics values, cohesion, derived values, internal friction angle.*

BIO-REINFORCEMENT OF SLOPES

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Abstract

The influence of vegetation on mechanical soil behaviour represents a significant factor to be considered in erosion control. This type of erosion control process is named bio-reinforcement and it is an environmentally friendly engineering method for shallow slope stabilization. The mechanical reinforcement made by roots has effect in shallow soil, where the most root biomass exists. Vegetation plays an important role in stabilizing settlements and infrastructures from hazards produced by water energy. The new trend named sustainability has forced engineers to rediscover vegetation as an engineering solution for shallow slope protection. This review paper presents various species of plants with an important role in slope stabilization applications. The need for a sustainable future creates a new engineering discipline, named Eco-geotechnics, which integrates knowledge from soil mechanics, botanics, engineering geology and atmosphere science.

Key words*: slope stability, bio-reinforcement, vegetation, roots tensile*

THE INFLUENCE OF FORESTS FROM LUNCA MUREŞULUI NATURAL PARK ON GREENHOUSE GASES LEVELS

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Abstract

The paper aims to analyze the influence of the stand characteristics in two areas of the Lunca Mureşului Natural Park, on the main greenhouse gases in the atmosphere (O_3, NH_3, NO_2). In the first part, an extensive bibliographic study was carried out, regarding similar research referring to greenhouse gases in generally and O_3, NH_3 and NO_2 in specially, and the relation of these greenhouse gases to forest vegetation. The working method regarding data collection in the period 2014-2019, the types of gases analyzed, the types of collection pads used, the exposure times of the collection pads were presented, together with the working method for data processing. The results were obtained by analyzing relation of certain characteristics of the stand (age, volume, stand density) with concentration of studied greenhouse gases on vegetation season from the period 2014-2019. The obtained results were discussed in the context of other current research in the field and the most important aspects were presented as conclusions at the end of the paper.

Key words*: atmosphere, forest age, height of trees, stand composition.*

COMPLEX ORGANO-MINERAL FERTILIZERS BASED ON SEWAGE SLUDGE WITH MINERAL ADDITIVES AND THEIR EFFECTIVENESS IN GROWING CORN FOR SILAGE IN THE FODDER CROP ROTATION CHAIN IN THE NORTHERN FOREST-STEPPE OF UKRAINE

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Abstract

It was determined that the sewage sludges of the sewage treatment facilities of a million-plus city and the industrial centre in the north of Ukraine, after the final aging on sludge sites, according to agroecological indicators, are suitable for their use as a local organic raw material to produce innovative types of complex organo-mineral fertilizers. The composition of complex organo-mineral fertilizers based on sewage sludge with mineral additives of various origins was developed and new types of organo-mineral fertilizers of prolonged action for multi-purpose use were obtained. When studying the effectiveness of new types of organo-mineral fertilizers in a field experiment, it was established that on gravy forest soil under the conditions of the northern Forest-Steppe of Ukraine, fertilizers of the first type were not inferior to traditional and non-traditional organic fertilizers in terms of effectiveness in the year of direct action when the main application was made in optimal doses under corn for silage and complete mineral fertilizer in equivalent doses. New organo-mineral fertilizers of the second type were not inferior to organic fertilizers in terms of direct-action efficiency.

Key words: *effectiveness, organic-mineral, mineral additives, sewage sludge; Ukraine.*

THE IMPACT OF *Eurydema ventralis* ON CAULIFLOWER (*Brassica oleracea* var. *botrytis*) GROWN AT DIFFERENT CO_2 CONCENTRATIONS

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Abstract

In the Brassicaceae family, a variety of vegetable crops that are high in nutrients are found, such as cauliflower, common-headed cabbage, broccoli, kohlrabi, kale, and Brussels sprouts. Cauliflower (Brassica oleracea var. botrytis) is an important crop grown worldwide. The cabbage bug (Eurydema ventralis) belongs to Hemiptera line, the Shield bug family, Pentatomidae, it is a very common specie, and it occurs in many parts of Europe. This bug can harm plants as an adult or larvae by sucking the juice of leaves. At the puncture sites, bright spots develop, the tissue dies, falls out, and asymmetrical holes develop. This study aimed to analyse the impact of cabbage bugs on cauliflower plants grown at 400, 800, and 1200 ppm. The attack of the cabbage bug influenced the leaf`s photosynthetic parameters, volatile organic compounds emission, chlorophylls, polyphenols, and flavonoid contents. Even more, the plants grown at various concentrations of CO_2 have different responses to the attack of the cabbage bug.

Key words*: cauliflower, Eurydema ventralis, elevated carbon dioxide concentration, photosynthetic parameters.*

THE SYNERGIC EFFECT OF HIGH TEMPERATURE AND ELEVATED CARBON DIOXIDE ON CAULIFLOWER PLANTS

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Abstract

The occurrence of an unusual triple-dip during La Nina will likely result in 2022 being `just` the fifth or sixth hottest year on record. Despite this, the long-term trend will not be altered, and it is just a matter of time before there is another year that sets a record for the highest temperature. In the last years, the global concentration of carbon dioxide has risen more than ever, from 385 ppm in 2010 to 416 ppm in December 2022. This increase represents 47 percent since the beginning of the Industrial Age. To study the synergic effect of carbon dioxide and high temperature on plants, we used Brassica oleracea, variety botrytis grown at 400, 800, and 1200 ppmv CO_2 and high-temperature stress was applied. We have shown the photosynthetic parameters as assimilation rates and stomatal conductance is affected more for plants grown at high carbon dioxide. Furthermore, the concentration of the primary and secondary metabolite in the plant leaves decreases with the stress strength. This work was supported by a grant from the Romanian National Authority for Scientific Research, CNCS - UEFISCDI, project number PN-III-P4-ID-PCE-2020-0410.

Key words*: abiotic stress, climate changes, elevated carbon dioxide, secondary metabolites.*

THE IMPACT OF THE BIOTIC STRESS ON THE PLANTS GREW AT ELEVATED CARBON DIOXIDE

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Abstract

The yearly global greenhouse gas emissions (GHG) will reach 58 gigatons (GT) in 2022, the highest annual amount ever recorded. If the existing patterns in economic development, population, and intensity of emissions continue, the level of emissions will continue to climb and reach 62 GT by 2030. In these conditions, the atmospheric carbon dioxide concentration overlooks 421 ppm. It has been shown that plants grown at elevated carbon dioxide are more sensitive to stresses. We used plant species from Brassicaceae family (Brassica oleracea, variety capitate, Brassica oleracea, variety botrytis,) grown at high carbon dioxide to test their sensitivity to cabbage moth (Mamestra brassicae), cabbage white (Pieris brassicae), Greenhouse whitefly (Trialeurodes vaporariorum). The photosynthetic parameters, volatile organic compounds emission, chlorophylls, and flavonoid contents of the leaf have been disturbed by insects feeding. We have shown that the plants grown at elevated carbon dioxide are more susceptible to being severely affected by insects than those produced at 400 ppm. This work was supported by a grant from the Romanian National Authority for Scientific Research, CNCS - UEFISCDI, project number PN-III-P4-ID-PCE-2020-0410.

Key words*: biotic stress, climate changes, volatile organic compounds.*

PREDICTIONS ABOUT SESSILE OAK FOREST ECOSYSTEMS FROM BANAT MOUNTAINS IN THE NEXT 80 YEARS

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Abstract

The climate impact on sessile oak ecosystems may be measured by means of the HYPE climatic software. The climatic modelling software is employed to predict future temperatures and precipitations across the studied teritory. After interpreting the data provided by the software, we can predict how forest ecosystems will be influenced by climate change in the future. Different plots across the Banat Mountain range have been studied in order to determine the future existence of oak forest ecosystems. Consequently, two simulations have been designed, leading to two different future climatic scenarios. To begin with, the first scenario there is a moderate increase in green house gases (rcp-4.5) whilst in the second scenario there is an accentuated increase (rcp-8.5). The analysis which resulted from the data processing from within all three sessile oak stands reveals the fact that the Moldova-Noua and Paltinis stands will be the most vulnerable ones and the Bocsa-Romana stand the less vulnerable one. The importance of these results is closely related to how local forest administrators can use such findings in order to apply the best management measures.

Key words*: Banat Mountains, climate change, forest ecosystems, sessile oak.*

EMBEDDING LOW CARBON EMISSION INTO THE WATER INFRASTRUCTURE IN ROMANIA

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Abstract

Climate change is the biggest global challenge of our times. If, at all levels of society and organisation, we can work together to reduce carbon emissions while also planning how to adapt to change, we can prevent climate change from making our planet uninhabitable. Romania is committed to fighting climate change and pursuing low carbon development. Therefore, the Government of Romania, through the Ministry of Environment and Climate Change (MECC), has requested the World Bank to provide advisory services to help meet this commitment. To reduce the carbon footprint of the infrastructure is essential to assess the carbon embodied in the materials and construction methods, plus the operational carbon emissions of the resulting asset. Carbon Management in Infrastructure provides a national framework for these assessments and can be directly applied to the water industry as it needs to engage the whole value chain to achieve the net zero commitments.

Key words*: Carbon Management, Climate Change, Emissions, Net Zero Carbon.*

PROCESS AUDIT AT A GRINDING PLANT (CEMENT MILL) AT A CEMENT FACTORY - A CASE STUDY IN ROMANIA

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Abstract

The process audit is an analysis for the operation of an equipment, to establish its performance and to make proposals for measures to increase production, decrease consumption and improve product quality. The objective of the process audit is to establish the actual state of operation for the cement grinding plant (the degree of loading with grinding bodies, the air speed in the mill, the granulation of the material at the entrance and the exit, the wear of the shields, energy consumption) and is the basis for proposing measures for optimization. The audit from a grinding plant is carried out in the following situations: upon commissioning (to record the initial condition of the equipment) after modernization/modifications of the equipment in the composition of the grinding plant whenever there are deviations from the expected performance as a routine test, at least once a year, to appreciate the real condition of the equipment. The paper presents some determinations made at a cement mill from a Romanian cement factory, the sampling method to carry out analyses and recommendations for improving production.

Key words*: grinding ability, grinding chart, grinding efficiency, process audit, particle size analysis,*

LAND DEGRADATION AND CLIMATE CHANGE

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Abstract

Land degradation is a worrisome phenomenon that is closely related to climate change, contributing to the accentuation of climate change and at the same time being caused by it. Land degradation is mainly caused by human activities that lead to soil pollution or degradation, by agricultural practices, by forestry management, urbanization but also by extreme weather phenomena such as floods and droughts. Desertification is also a land degradation phenomenon that is caused by climate change and that contributes to intensifying climate change. This study aims to summarize the main causes leading to land degradation and which have a major contribution to the exacerbation of climate change, but also to identify the appropriate measures to avoid, reduce and reverse land degradation. At the same time, this study identifies the main direct and indirect impacts of land degradation on people's way of life. Regarding the impact of climate change on land degradation, the study identifies ways in which climate change accentuates land degradation processes.

Key words*: climate change, land degradation, impact.*

WORKS SPECIFIC TO THE INTRODUCTION OF SILVOPASTORAL SYSTEMS IN THE FOREST FUND

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Abstract:

The introduction of areas with a different use into the forest fund is relevant for several reasons considering the area of the forest fund in our country which is below the European average. In recent decades, silvo-pastoral systems, represented by common pastures with partially afforested meadow, have undergone a series of transformations. In a great measure they have been abandoned, which is why successions of pioneer species, with low ecological and economic value, have been triggered on these surfaces. As a result, the utility of these silvo-pastoral systems has been reduced considerably, in some cases their introduction into the forest fund being opportune or even necessary. The current legislation regulates the possibility of introducing into the forest fund some areas occupied by forest vegetation in compliance with some functional and administrative conditions - the consistency index > 0.4, the necessity to prepare a forestry management plan, the observance of the forestry regime, etc. The works necessary for the introduction of the silvo-pastoral systems into the forest fund involve a series of specific activities, namely precise delimitation and spatial positioning of the related areas, their mapping and evaluation, the establishing of the complexity of necessary silvotechnical interventions and, finally, the ensuring of their ecosystem stability. Therefore, these works will be executed in stages, depending on the complexity of the condition's characteristic to these activities.

Key words: *forest fund, forest vegetation, silvopastoral systems, silvotechnical interventions, succession of pioneer species.*

HEAVY METALS ACCUMULATION IN THE TISSUES OF THE COMMON REED (PHRAGMITES AUSTRALIS)

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Abstract

The aim of the present study was to provide a comparative analysis related to the concentration of heavy metals (Cd, Pb, Ni, Cr) in the tissues (stem, leaves, panicle) of the common reed (Phragmites australis). The reed samples were collected from 10 different sampling stations located in Danube Delta Reservation Biosphere, 2 sampling station from Lake Brates and 2 sampling station situated on a tributary of the Danube River (Chineja River), Romania. The concentration of heavy metals varied depending on the location, the lowest values were found in plants located on the course of the Chineja River. As well, depending on the plant structure, was observed that the panicle contained the lowest concentrations of the chosen heavy metals for the experiment.

Key words*: heavy metals, common reed, bioaccumulation.*

SPATIAL DISTRIBUTION OF PHARMACEUTICALS IN THE LOWER DANUBE RIVER WATER

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Abstract

Pharmaceuticals are part of the emerging pollutants class found in aquatic ecosystems. The presence of these contaminants in the aquatic ecosystem can have harmful effects on living organisms due to their toxicity and ability to accumulate in tissues. In this study, water samples taken from stations located in the Lower Danube River Basin were analysed to identify and quantify some classes of pharmaceuticals. To confirm the presence of pharmaceutical traces in surface water samples, a High-resolution UHPLC-MS/MS was used. The obtained results demonstrated that the most frequently identified pharmaceutical residues in the water samples were: caffeine > carbamazepine > metformin > sulfamethoxazole > trimethoprim > clindamycin > ketoprofen > diclofenac > clarithromycin. The highest concentration recorded was 118, 52 ng/L for caffeine and the lowest value was 0.36 ng/L for trimethoprim.

Key words*: surface water, pharmaceuticals, emerging pollutants, Danube River.*

AN AUTOMATED METHOD OF FORESTRY DETERMINATION USING A UAV LIDAR-MOUNTED PLATFORM

Maxim ARSENI, Octavian ROMAN, Madalina CALMUC, Valentina-Andreea CALMUC, Adrian ROSU, Stefan-Mihai PETREA, Catalina ITICESCU, Puiu-Lucian GEORGESCU

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Abstract

LiDAR is one of the most promising technologies in the forestry industry. The LiDAR scanning methods help to improve and to drive sustainable forest management. The main purpose of this paper is to apply the UAV LiDAR scanning method, to identify and measure the tree volume calculation along a road section. The flight was made using a UAV octocopter and a LiDAR system. To determine the forestry volume several steps of postprocessing were applied. Therefore, we create a 3D point cloud reconstruction of large forest areas. After the preliminary post-process, we apply a segmentation for the study area and track individual trees, to create an inventory for the detected trees. Determining the tree volume helps to make a correct financial estimation of the elimination of this from a new road or area that changes its destination. On the overhand, automated methods like LiDAR scanning of forestry and terrain, and automated tree volume calculation helps to improve the time spent confronted with traditional taxation methods.

Key words*: LiDAR, UAV, Forestry segmentation, Point cloud classification.*

ANALYSIS REGARDING THE INCREASE IN THE RESISTANCE OF CEMENTITIOUS SELF-HEALING COMPOSITES TO THE ACTION OF MICROORGANISMS BY INDUCED PHOTOACTIVATION CAPACITY

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Abstract

The development of biofilms of micro-organisms on the surface of buildings, in addition to the negative impact and risk to the health of the population, leads to their degradation and the need for continuous sanitation operations. Inducing superhydrophilicity and self-cleaning performance of cement surfaces by adding TiO_2 nanoparticles to the composite matrix, as a result of photoactivation reactio. This method, can become an effective for the production of new materials in order to increase the durability of buildings and to increase the degree of hygiene, due to the ability of these new materials to inhibit the growth of microorganisms. Experimental results have shown that in case of contamination with two types of moulds (Aspergillus niger, Penicillium notatum) and four types of bacteria (Escherichia coli, Pseudomonas aeruginosa, Staphylococus aureus, Streptococus pyogenes) respectively, the development of harmful biofilm is inhibited. This performance was monitored using the dimensional development of the specific inhibition halo as a quantifiable indicator. It can be said that it is influenced by the type of contaminant and the nanoparticle content of the cementitious composite matrix, but is manifested in all cementitious composites containing TiO_2 nanoparticles photoactivated under laboratory conditions.

***Key words**: biocidal effect, photocatalysis, self-cleaning cementitious composites, TiO_2 nanoparticles.*

MANAGEMENT OF MANURE

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Abstract

In this paper, we aimed to achieve the management of the manure taken from five localities near the county of Iași, Romania. For this, two manure storage platforms with an area of 500 square metres will be built for its temporary storage. The platforms will serve the small farmers in this area, consisting of the platform itself and a collection basin located next to the platform, where the water from precipitation, animal urine and water for sanitising the platform reaches. Thus, this paper describes the constructive elements of the platforms, calculates the volumes of water collected from its surface and sizes the collection basin. The collection basin will have a volume of 120 m^3 and has been sized to ensure a storage capacity for a period of 30 days of precipitation and all liquid fractions resulting from the composting process.

Key words*: collection basin, manure, management, storage platform.*

STUDY OF AIR POLLUTION LEVEL IN AN URBAN AREA USING LOW-COST SENSOR SYSTEM ONBOARD MOBILE PLATFORM

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Abstract

The paper aims to assess the air pollution level using one mobile low-cost measurement system versus in situ sensing data from local air quality network stations. The measurements were performed during the winter of 2022 on the main streets of Galați city, one of the largest cities in Romania. The main purpose of the measurements is to use mobile measurements to capture the spatial and temporal distribution of important air pollutants such as NO_2+O_3, CO, SO_2, and PM_{10} in large urban areas. For this study used a mobile air quality monitoring system Sniffer 4Dv1 to record spatial and temporal data on air pollutants on the street of Galati City. The data sets from local RNAQMN (Romanian National Air Quality Monitoring Network) are compared with Sniffer 4Dv1 data to infer various limitations for each of the two data sets.

Keywords*: Air pollution, Air quality, AQS in situ measurements, mobile measurements.*

THE IMPACT OF LOGGING ACTIVITY ON RESIDUAL TREES - A CASE STUDY FROM SOUTHWEST ROMANIA

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Abstract

The paper aims to analyze the impact of logging activity on residual trees from logging yards from southwest Romania, located in plain, hill and mountain area and covered with a large variety of silvicultural works-first-intervention cuttings, preparatory and seed-cutting (shelterwood systems or selection systems), cuttings to increase light availability for regeneration (shelterwood systems), final cuttings (shelterwood systems). The impact of logging activity on the residual trees was analyzed based on the data obtained from the measurements made at the end of the vegetation season of 2019 and the beginning of the vegetation season of 2020. Based on the data obtained, the total number of tree damages in the variants studied on relief forms, the relationship between the number of tree damages and different stand characteristics, and the damages distribution by their types in the studied variants, were analyzed. Trees damage evaluation was done by determining damage indexes calculated as a ratio between the volume of damages found and the volume of damaged trees. The most important conclusions have been discussed in the context of other researches in the field.

Key words*: tree damage, logging yard, barking wound, trees wound.*

THE RISK ASSESSMENT FOR THE MANAGEMENT OF PETROLEUM PRODUCT STORAGE & DISTRIBUTION SITE

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Abstract

The paper presents a risk assessment for the management of contaminated sites. For defining the solutions for management of petroleum products storage and distribution, sites there were developed two main activities. The first one consists in a detailed site investigation using a conceptual model to define its geological, hydrogeological characteristics and surely the contamination level. The second activity is dedicated to the assessment of risk generated by the soil, subsoil, air and groundwater contamination, by using a professional software applied to a real case study. The results showed that for carcinogenic and non-carcinogenic compounds the risk is above the thresholds according to the legislation. The conclusions of this analysis allow establishing the measures to mitigate this risk, based on a feasibility study and the best solutions for site remediation (soil and groundwater) could be designed to mitigate these risks.

Key words*: assessment, contaminated, deposits, risk.*

MACHINE LEARNING-BASED MODELING FRAMEWORK FOR IMPROVING ROMANIAN RESILIENCE STRATEGY TO GREENHOUSE GAS EMISSIONS IN RELATION TO VISEGRAD GROUP

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Abstract

The present research aims to reveal the difference between Romania and V4 in terms of the GHG Emissions Strategy and to establish a machine learning (ML) - based modeling framework for improving the ability to reach zero GHG by the mid-21st century. The ML tree-based algorithms, based on dual dimension environmental-economic nexus, revealed that net greenhouse gas emissions (NGHGE) are mostly conditioned by GHG from agriculture (GHGA), a fact valid both in the case of Romania (feature importance - FI = 0.41) and V4 (FI = 0.86). However, for V4, the 2nd important predictor is identified as greenhouse gases from waste management (FI = 0.26), while in the case of Romania, the national expenditure on environmental protection has a limited impact (FI = 0.02) on NGHGE. Both integrated models have good prediction accuracy (Rsq. 0.70, RMSE 0.53 for the model associated with the Romania database and Rsq. 0.76, RMSE 0.47 for V4 models). It is concluded that in terms of integrated GHG emissions management strategy, Romania can merge with V4 to increase the environmental efficiency towards achieving the EU environmental goals.

Key words*: machine learning, environmental modeling, GHG, environmental strategy, tree-based models.*

PREDICTION MODELS FOR IMPROVING WASTE DECISION SUPPORT MANAGEMENT IN ROMANIA IN ASSOCIATION WITH V4 MEMBER COUNTRIES

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Abstract

The research targets to develop multiple prediction models for supporting waste-decisional management, considering the specificity of Romania, in association with Visegrad (V4) countries. The results are based on the application of XGBoost algorithms and indicate that total waste, as a dependent parameter, can be accurately predicted considering plastic wastes (feature importance-FI = 1.53, Rsq. = 0.75, RMSE = 0.47) in the case of V4, while for Romania, the independent parameters identified as most reliable are chemical wastes (FI = 0.58) and industrial effluent sludges (FI = 0.04), Rsq. = 0.46, RMSE = 0.75. In terms of waste treatment (WT), the portable batteries and accumulators market (FI = 0.45) presents high reliability to be used as the main predictor (Rsq. = 0.80, RMSE = 0.42) considering the V4 database, while for Romania, the waste generation (FI = 1.57, Rsq. = 0.85, RMSE = 0.36) explains, mostly, the variability of WT. Batteries and accumulators waste (FI = 0.77, Rsq. = 0.82, RMSE = 0.39) can be used as a reliable predictor for WT, considering a more extended analytical framework, for Romania. Waste decision support management can be supported by ML models, which are different in the case of Romania, compared to V4, emphasizing the regional importance when developing environmental modeling-based tools.

Key words*: prediction models, waste treatment, waste decision support models, XGBoost, waste framework.*

DATA COLLECTION IN THE WILD: CHALLENGES AND SOLUTIONS

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Abstract

Extensive monitoring plays a key role in environmental protection. This task, however, has many issues to solve, communication and data collection being a difficult one. This paper focuses to the challenges of observing hard-to-access areas, e.g., such as forests and wetlands. The performance of the possible solutions for this problem are compared, focusing to sensor networking and LPWAN technologies, and a drone-based solution will be proposed. The presented method offers a robust, and reliable, yet simple data collection solution. The hardware and software architecture, the communication protocol will be described, and the estimated performance of the system is analysed.

Key words*: environment, data collection, UAV, LPWAN.*

ANALYSIS OF THE IMPACT OF LAND USE CHANGES ON SOIL EROSION USING THE INTERO MODEL - CASE STUDY IN HYDROGRAPHIC BASINS IN ROMANIA

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Abstract

Soil erosion harms the environment and economy. Soil erosion reduces soil fertility, crop productivity, and water use, costing $8 billion globally. Water and wind erode soil, rocks, and sediments. Deforestation, overgrazing, urbanization, and poor agriculture cause soil erosion. Tillage, crop rotation, contour farming, terracing, and agroforestry reduce soil erosion. Organic matter and soil structure improve soil health and reduce disturbance. Soil conservation knowledge and action must also be promoted. All watersheds are affected by land use change. Modifications cause erosion. We studied land use changes and soil erosion in a Romanian watershed. Land use change influences soil erosion quickly and easily in the model. National advancement required testing watershed management approaches. Soil erosion degrades topsoil and reduces global agricultural production. Cluj County`s hills are eroded. Understanding watershed soil erosion mechanisms helps control erosion and conserve soil. This research calculates sediment yield and maximum discharge from Cluj County`s Batin, Chinteni, and Rasca Mare hydrographic basins using IntErO, a computerized graphic model. The IntErO model was first used to calculate soil erosion rates in Nepalese hills and has significant potential for similar watersheds.

Key words*: erosion modeling, GIS, Intero, USLE.*

SUSTAINABLE DEVELOPMENT OF RURAL AREA

ADAPTATION STRATEGIES TO CLIMATE CHANGE WITH SUSTAINABLE IRRIGATION

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Abstract

Global warming and climate change are the biggest problems of the world today. Agricultural irrigation plays a very important role in both increasing production and reducing the potential risk of drought. However, excessive use of water in agriculture (>10 000 m^3 ha^{-1}), very low irrigation efficiency (35-50%) and the effect of climate change cause a rapid decrease in water resources. In adaptation to climate change, efficient use of water resources in agricultural production, irrigation water productivity (kg m^{-3}), economic productivity of water ($ m^{-3}), farmers' net income ($ ha^{-1}) and total water use (m^3 ha^{-1}) should be considered for each irrigated area. Thus, both the farmers, the irrigation authority and the decision makers can choose to implement possible deficit irrigation strategies and/or the most effective water use strategies according to these parameters. Thus, the main categories might be identified under the sustainable resource management, water management, technological developments, farm management, and farm production practices. Adaptation strategies to climate change can be implemented, but the costs and benefits of these practices need to be well understood.

Key words*: climate change, irrigation, irrigation efficiency, sustainability, water productivity.*

THE SOIL FERTILITY IMPROVEMENT OF THE MARGINAL LANDS DEPENDING ON KIND OF AMENDMENTS

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Abstract

The major goal of this case study was to estimate the impact of two soil amendments on soil fertility, grain crops yield, and quality. The greatest effect of increasing sweet sorghum biomass produced in loess like loam has been obtained using sewage sludge (SS) at the rate of 80t/ha. Such a reaction has become appropriate to the introduction of nutrients into the "young" soil. The SS applying by rate of 60 t/ha had little effect on the increase in the content of zinc and copper in sunflower seeds in the experiment managed on black soil. Trace concentrations of lead and cadmium are recorded. The addition of vermicompost and a solid fraction of digestate at a rate of 40 t/ha led to an increase in the corn grain yield obtained on black soil at the 20.1 and 35.0%, respectively. The greater starting effect on urease activity was recorded from the introduction of vermicompost compared to the solid fraction of the digestate. The application of the solid fraction of the digestate had a positive effect on the activity of phosphatase in the topsoil in the first part of the season of vegetation.

Key words*: amendments, crops yield, heavy metals, marginal land, soil fertility.*

THE POSSIBILITY OF ESTABLISHING A GOJI CULTURE AND ITS EFFICIENCY THROUGH ADAPTATION TO THE PEDOCLIMATIC CONDITIONS OF GORJ COUNTY

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Abstract

In the current agro-economic context, for the rural development of Gorj county, it is important to identify new, attractive, but also economically efficient businesses. Starting from the fact that the interest in Goji fruits has increased significantly, along with their use in organic food and in traditional medicine, and the adaptation of this shrub to the pedoclimatic conditions in Gorj county, if the culture technology is respected, this study present the possibility of establishment and capitalization of a culture that is not specific to the area, but which, through its characteristics, can adapt to the pedoclimatic conditions in Gorj County. Following the economic analysis, it is demonstrated that this business has a positive impact on the sustainable development of the rural area of Gorj County, on the economy, on the social life and on the environment, by capitalizing of agricultural land, creating jobs, promoting the area and increasing the income of entrepreneurs.

Key words*: culture, economic efficiency, Goji.*

ARE THERE OPPORTUNITIES OF USING SOLAR ENERGY IN IRRIGATION SYSTEMS?

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Abstract

The paper aims to have a look over the energy production over the time, and its specific nowadays, with the desire to find alternative solutions, but considering the specifics of the way in which irrigation systems and schemes in Romania are structured and used, and watering methods are distributed according to the plants, over the territory. Analysing the Romanian Energy System for 2 different periods (winter and summer) and the distribution the energy sources, there are comparisons between the evolution of energy production and energy needed for irrigation. In that manner it is possible to conclude if solar energy has efficient utilization.

Key words*: energy, solar, irrigation, consumption-demand balance, storage.*

SYSTEM OF RICE INTENSIFICATION (SRI) AS THE WAY OF PRODUCTION SYSTEM FOR SMALL HOLDER FARMERS TO SUSTAINABILITY: CASE STUDY FROM THAILAND

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Abstract

This participatory research was to assessment and reflection about system of rice intensification (SRI) of farmers. The data were collected from 36 farmers which participating in the SRI extension project by in-depth interview, focus group discussion, participatory workshop for enumeration and recording data from farmers' experimental plots. The results showed that the farmers who participate in the project reflects to rice planting by SRI method had affected better than farmer practice (FP) planting (conventional) method in terms of input, production, and yield and consistent with the results of the farmers' plot trial which found that the average yield of SRI planting method higher than the FP method at 26.54 percent (P<0.01). The results of the learning process from FPAR implementation as results to farmers in the project could be able created direct experience by action and experiential learning. Farmers participating project could be scaling up and extend the learning of SRI to other farmers in the model of farmer-to-farmer technology transfer.

Key words*: farmer learning process, participatory assessment, system of rice intensification.*

DISASTER MANAGEMENT

SPATIAL DATA RESULTING FROM THE AUTOMATION OF THE PERMANENT SEISMIC MONITORING SYSTEM

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Abstract

The stations from the INCD URBAN-INCERC network are distributed throughout the country, including Bucharest, and are located either in free-field conditions, in small buildings, in medium-height buildings or in boreholes. The interactive map representation of the seismic stations and the automatic monitoring of their operation, based on the analysis of received data, is currently carried out with the SeisComP software. The paper exemplifies, as performance benchmarks, some data processing obtained in 2022 within the permanent seismic monitoring system.

Key words*: seismic data, seismic network, spatial analysis, semi-automatic generation of PGA maps.*

ANALYSIS OF SEISMIC DATA FROM MODERATE INTENSITY EVENT OF 2022.11.03 RECORDED ON INSTRUMENTED STRUCTURES

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Abstract

There is a need for safer constructed medium in order to respond to the constant necessity for raising the security level of human society to earthquakes impact. In this respect the buildings monitoring in areas subjected to seismic site effects provides the possibility of getting immediate and reliable information on the status of certain structures, which enables decision makers to better allocate resources and to direct rescue operations. A procedure is implemented, which allows to perform real-time data acquisition, data exchange and data analysis from structures exposed to seismic excitation or under ambient vibration. The processed recordings are used to deliver information in real time about the seismic event. Engineering seismology parameters are computed: maximum acceleration, spectral acceleration, corresponding oscillation periods, etc., on both structures and free field. The output is conceived as a standard report on the characteristic response of the instrumented building. In the paper such an approach is described in an extended and thoroughly version, for two instrumented buildings, located in different areas, under the last year's strongest seismic event of 2022.11.03, $M_w = 5$ that hit the Romanian territory.

Key words*: near-real time seismic analysis, moderate Vrancea earthquakes, structures monitoring performance.*

THE STATE AND BEHAVIOR OF SOME FORESTRY CULTURES INSTALLED ON DEGRADED LANDS IN THE FOREST-STEPPE SITE

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Abstract

The research carried out aimed at capturing the structural and qualitative changes, the overall evolution of forest ecosystems on degraded lands and highlighting the types of effective cultures on different categories of degraded land. The research was carried out in the period 2017-2018 in research plots located in perimeters for the improvement of degraded lands, in representative situations. In the paper are presented synthetically the data regarding on the characteristics of forestry cultures in the forest-steppe site, realized in different compositions on lands with various forms of degradation.

On very strongly eroded and ravenous lands, the forestry cultures made with black pine in intimate mixture with xerophytic species and shrubs, gave good results. On moderately to heavily eroded lands, mixed cultures with oak and different species, gave good results, in association them in bio groups or grouping at least 2 rows of oak interleaved with accessory species and shrubs. The obtained results offer particularly valuable information for the scientific substantiation of future afforestation compositions and of the silvotechnical works for the installation and tending of forestry cultures on degraded lands.

Key words*: afforestation, degraded lands, forest-steppe, forestry cultures.*

THE PARTICULARITIES OF THE ECOLOGICAL REHABILITATION WORKS OF THE SESSILE OAK STANDS (*Quercus petraea* (Matt.) Liebl), FROM THE SEED RESERVE

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Abstract

The sessile oak stands within the seed reservation that were affected by the extreme weather phenomena (windthrown and windsnapped trees) on the 17th of September 2017, from the forest fund of the U.P. VII Văratec, the Forest District Sudrigiu, County Forest Administration Bihor, presents a relatively low ecosystem stability, considering the impact suffered. After the identification of the sessile oak stands affected (by extreme weather phenomena), the assessment of the affected wood material was carried out and implicitly, its extraction and superior valorization. The necessary works, proposed for the ecological rehabilitation of the sessile oak stands that have been examined and studied, take into account their actual state, the regulations of the forestry management plan for the current decade, the provisions of the technical norms in force at the date of implementation of the study, and last but not least, the necessary logistical and financial possibilities.
Surfaces from which the wood material was extracted, will be delimited in separate management units, which will regenerate naturally from the seed coming from the remaining stands, thus preserving their provenance in-situ.

Key words: *ecological rehabilitation, extreme weather phenomena, natural regeneration, sessile oak, seed reservation.*

SEISMO-ARCHAEOLOGY IN ROMANIA: THE ANCIENT EARTHQUAKES AS A PATH TO FUTURE KNOWLEDGE

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Abstract

The earliest chronological data on seismic events in the history of Romania date from the 10th century, but the data on strong earthquakes from the intermediate depth source Vrancea are limited to the 19th and 20th centuries. To compensate for this gap, we can turn to seismic archaeology or archaeoseismology, an interdisciplinary science based on archaeological and engineering methods and data. In this context, we present data for the initiation of the study of the possible impact and seismic damage to sites and settlements, castra, forts and Roman vallums in Dacia. These were in seismic zones of southeastern Dacia / Moesia Inferior, southwestern Dacia – Dacia Malvensis. Of interest is the line of forts on the Limes Alutanus and Limes Transalutanus, the Danubian Limes - in Dacia Malvensis, as well as in Moesia (beyond the Danube), areas exposed to strong accelerations of 0.20-0.25 g. As a result, the research should prove the years of impact and damage or destruction of some constructions by earthquakes, so that we have an extended basis for future hazard and seismic risk assessments.

Key words*: earthquake archaeology, Roman Limes, Vrancea seismic source.*

ASSESSMENT OF THE SAFETY OF URBAN GREEN AREAS USING GIS

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Abstract

This paper aims to present a GIS-aided safety map related to the non-invasive assessment of trees in urban green areas. The goal is to create urban GIS-based evidence of the green areas focused on hidden tree pathology, in order to increase the safety of urban parks and provide an instrument for decision-making to eliminate trees that pose a danger to citizens due to hidden pathology. This is especially important considering the tremendous physical destruction, injury, loss of life, and economic damage caused by wind disasters, as well as concurrent heavy rains and flooding, which have become increasingly common in recent decades. Improved observational capabilities and recordings of such events have led to greater public awareness of severe weather events.

Key words*: urban safety, urban green, GIS.*

WATER RESOURCES MANAGEMENT

IMPROVING THE SYSTEM OF LOGISTICS MANAGEMENT AND SIGNALING, IDENTIFICATION, CLASSIFICATION OF NONCOMPLIANCE IN THE WATER BOTTLING INDUSTRY

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Abstract

Starting from the Kaizen approach which aims at continuous improvement, the study synthesizes the information regarding the classification, identification and reporting of defects and all types of non-compliance encountered during the manufacturing process in the food industry, particularizing on a water bottling process. Starting from an optimized logistic system model within the organization, the article deals with the non-conformities on the material and informational flow system, or for technological equipment (machines, equipment and installations). A chi-square test was performed to evaluate the occurrence of defects in different equipment of the technological process. The study is a tool to keep under control the problems that appear and can be constituted in a standard or an internal procedure of the company applicable when a non-compliance is identified. The analysis is carried out to show how to facilitate the signalling, identification, classification, isolation and evaluation of the non-compliant product or service in order to prevent non-quality. The methodology is an effective and efficient tool in preventing non-conformities.

Key words*: defects, industry, non-compliance, quality, statistics, water bottling.*

STATUS, PROBLEMS AND SOLUTIONS CONCERNING SURFACE WATER MANAGEMENT IN BULGARIA

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Abstract

Water resource conservation and management is vital as well for humankind, as for nature and economy, and is exposed to anthropogenic and climatic pressures, transcends national boundaries. The EU Water Framework Directive 2000/60/EC establishes a legal framework to protect and restore clean water in the EU and to secure its long-term sustainable use and mitigate the effects of floods and drought. In this regard, EU member-states are developing river basin management plans based on current characteristics and water status and programs with measures. In the planning process were identified different types of pressures on the surface waters, defining the significant management issues, such as pollution with biogenic substances, organic and chemical pollution, pressure from water intake and climate pressure. These problems solutions require both science-based approaches and specific target measures definitions to improve the water resources status and the level of their management.

Key words: *chemical pollution, ecological status, scientific approaches, water intake.*

DRAMATIC REDUCTION OF THE WATER AND SEDIMENT FLUXES IN A HUMAN MODIFIED MEANDERING ECOSYSTEM FROM THE DANUBE DELTA, ROMANIA

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Abstract

The pressure control of the anthropogenic factors has consequences on the fluvial systems, generating structural changes. The hydrology, hydraulics and sediment load of the rectified meandering systems depend on the hydrologic connectivity with the main stem of the river. The former meanders can be permanently, temporarily disconnected with the main channel producing interruptions in the transfer of fresh water and thus affecting the morpho-sedimentological processes and the biodiversity. This paper aims to investigate the distribution of the water and suspended sediment fluxes between the former meanders and the artificial man-made canals along the St. George distributary and thus, the hydrological connectivity. Understanding these complex human pressures are of high importance for reaching/ maintaining the ecological status of the Danube. Herein, we made investigations along the St. George branch on many sub-systems river-channel-lake site type, formed by cut-off meanders, connective channels and lakes to observe how much the water and sediment inputs to the delta depressions is affected by the structural changes of the meander's physiography.

Key words*: ADCP, cut-off meander, Danube Delta, hydrologic connectivity, human pressure.*

EFFICIENCY OF A RADIAL PRIMARY CLARIFIER FOR MUNICIPAL WASTEWATER

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Abstract

The prime method to combat water pollution, and a means to improve the quality of wastewater, is the wastewater treatment process, which is now widely used. The common method of mechanical (primary) treatment is (conventional) sedimentation at rest. Decanters (also called sedimentation tanks or clarifiers) are an integral part of every wastewater treatment plant. The present work aims to determine the performance of a radial primary clarifier in an urban wastewater treatment plant in Romania for the year 2020. The determinations were carried out for one winter month (January) and one summer month (July), and for the other calendar months the average inlet and outlet concentrations of the clarifier were determined. For each day of January and July, the concentrations of impurities (mg/L) in the wastewater at the inlet of the decanter (ci) and in the clarified water at the outlet of the decanter were recorded, based on which the separation efficiency of decanter could be determined. To improve the primary settling efficiency, the use of coagulating agents (iron and aluminum solutions) is recommended.

Key words*: efficiency, radial clarifier, sedimentation wastewater.*

THE EFFICIENCY OF HYDROTECHNICAL WORKS IN THE GURGHIU HYDROGRAPHIC BASIN

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Abstract

The characterisation and knowledge of the Gurghiu drainage basin represents a realistic analysis of the current state of the drainage basin. This analysis led to the obtaining of information on morphometric parameters specific to the drainage basin and the Orşova, Fâncel and Sirod sub-drainage basins; the current state, together with the effects and efficiency of torrent correction works in these sub-drainage basins and the knowledge of the grain size of the alluviums accumulated behind the hydrotechnical works. To analyse the profitability of the hydrological management work in the sub-drainage basin Fncel, a series of specific indicators were used: specific investment, duration of the recovery of the investment, updated net value, internal rate of return and profitability index. The total amount of alluvium retained in the valleys of the Gurghiu hydrographic basin is 24,960.3 m^3, with direct retention accounting for 6,774.55 m^3 and consolidation for 8,185.8 m^3. The analysis reveals that the costs associated with extracting torrential alluvium would have been roughly 1,859.55 thousand lei. Recommendations are to urgently restore essential repairs to damaged, broken, or detached parts of the work, to cover infiltrations and cracks and to complete masonry in places affected by degradations.

Key words*: forest management, rural development, sustainable development.*

HEAVY METALS ACCUMULATION IN PROCESSED FISH PRODUCTS AND RISK ASSESSMENT ANALYSIS ON HUMAN HEALTH

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Abstract

The present study aimed to evaluate the concentration of heavy metals (aluminium - Al, beryllium - Be, cadmium - Cd, arsenic - As, nickel - Ni, chromium - Cr, lead - Pb, zinc - Zn, and mercury - Hg respectively) in several processed fish foods (canned tuna, sardines, herring, salmon, and mackerel respectively) and assess the risks manifested on human health due to products consumption in Romania. In this context, the estimated daily intake (EDI) and target hazard quotient (THQ) was calculated based on the concentration of elements analysed by using the ICP-MS technique, the average fish products consumption in Romania and the average weight of Romanian consumers. The registered values for EDI and THQ were below 1, fact that indicates there is no risk on consumer's health. However, continuous screening of heavy metals contamination of food products is needed, due to the on-going risk for elements accumulation.

Key words*: fish products, heavy metals, risk assessment.*

EVALUATION OF HEAVY METALS CONCENTRATIONS IN THE BLACK SEA TURBOT AND ELEMENTS CORRELATION ANALYSIS

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Abstract

The Black Sea Turbot (BST) is one of the most valuable fish species exploited within the fisheries activities conducted in the Black Sea, due to market demand and high selling prices. However, due to the anthropogenic pressure exercised on the Black Sea, BST is prone to accumulate different contaminants such as heavy metals. The risk of heavy metals transfer to the human consumer, through fish consumption, is possible. Thus, constant evaluation of the biomass is needed in order to avoid consumer intoxication. It is well known that different metals manifest competing behaviour for binding spots when accumulating in biota. Therefore, the present study aims to evaluate the concentration of macro- (Ca, Mg, K, Na) and micro-elements (Fe, Zn, Cu, Ni, Cr, Mn, Co, Cd, Pb) in BST muscle tissue collected from the Romanian Black Sea sector and to determine the correlation relationship between them (Pearson coefficient). The following accumulation trend in BST muscle was identified: Na>K>Ca>Mg>Zn>Fe>Cu>Mn>Ni>Cd>Pb>Cr>Co.

Key words*: black sea, correlation, heavy metals, turbot.*

STUDY ON MICROPLASTICS OCCURRENCE IN THE LOWER DANUBE RIVER WATER

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Abstract

Microplastics are considered emerging pollutants of growing concern due to their ubiquitous presence and toxic potential in the aquatic ecosystem. However, there are few studies assessing the occurrence of microplastics in freshwaters, most articles are focused rather on the marine environment. Due to the lack of standardized protocols for separating and analysing microplastics, different methods are described in the literature data. In this paper, FT-IR spectrometry coupled with microscopy (micro-FT-IR) was applied to identify the presence of microplastics in the predeltaic sector of the Danube River. Based on the morphological classification, most of the microplastics collected were fragments, films and fibres. The results of micro-FT-IR analysis confirmed the majority presence of polyethylene and polypropylene-based microplastic particles in water.

Key words*: emerging pollutant, freshwater, micro-FT-IR, Lower Danube water.*

PRELIMINARY REPORT ON THE WATER QUALITY, ICHTHYOFAUNA AND BIOMETRIC INDICES FOR PRUSSIAN CARP FROM IEZERUL MOSTIȘTEA LAKE, ROMANIA

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Abstract

*Summarizing so far personal observations dated April 2023 and knowledge among anglers concerning the ichthyofauna of Iezerul Mostiștea located in Călărași County, was established that this ecosystem host 18 edible species. This paper analyzes for the first-time weight-length relationships, Fulton's condition factor and the size structure for Prussian carp in relation to water quality from Mostiștea Lake. A positive allometric growth pattern was estimated for Carassius gibelio: TW = 0.0148TL3.3097 (coefficient of determination R2 = 0.9803), TW = 0.0046SL3.4855(R2 = 0.977). The values for length ranged between 7.8 and 21.1 (average 11) cm for TL, 6 and 17.4 (average 8.77) cm for SL, while total weight varied from 5 to 174 (average 23.76) grams. Condition factor K ranged between 1.05 and 1.86. Also, two nematode parasites were recorded. Water samples collected from three sampling points were subjected to physico-chemical characterization and based on the results water was classified into quality classes. Total hardness values present very significant correlations with electrical conductivity (r = 0.8814***) and pH (r = 0.9183***). The determined parameters indicated that the water quality is optimal for the development of aquatic organisms.*

Key words*: Carassius gibelio, fish species, Mostistea, water quality, weight-length relationship.*

POLLUTION CONTROL, LAND PLANNING

HEAVY METAL ACCUMULATION AND CHEMICAL COMPOSITION OF ESSENTIAL OILS OF COSTMARY (*Tanacetum balsamita* L.) CULTIVATED ON HEAVY METAL CONTAMINATED SOILS

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Abstract

Comparative research has been conducted to determine the content of heavy metals and chemical composition of costmary oils, as well as to identify the possibility of costmary (Tanacetum balsamita L.) growth on soils contaminated by heavy metals. Costmary is a plant tolerant of heavy metals and can be grown on contaminated soils. Heavy metals do not affect the development of costmary and the quality of oil obtained from it. Twenty-three components were identified, accounting for 98.26-98.99% of the total oil components. The major components (> 1.0%) contained in costmary oil are carvone (42.66-44.12%), alpha-thujone (29.81-30.07%), beta-bisabolene (5.51-6.24%), 1,8-cineole (2.71-3.58%), beta-thujone (2,47-2,60%), cis-para-mentha-1(7),8-dien-2-ol (1,63-1,72%), trans-para-mentha-2,8-dienol (1.34-1.41%), cis-carveol (1.20-1.74%), and gamma-muurolene (1.69-1.78%). The content of oxygen-containing monoterpenes (88.75-89.41%) is the highest in costmary oil, followed by sesquiterpene hydrocarbons (7.74-8.35%), oxygen-containing sesquiterpenes (1.0-1.06%) and monoterpene hydrocarbons (0.58 -0.61%). The analysed costmary oils belong to the carvone - α-thujone chemotype.

Key words*: contaminated soils, costmary, essential oil composition, heavy metals.*

USE OF WASTE SLUDGE IN THE IMPROVEMENT OF THE QUALITY OF SOILS CONTAMINATED WITH PETROLEUM PRODUCTS

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Abstract

The ecological reconstruction of the sites contaminated with petroleum products is necessary to restore the geological environments affected by the economic activities specific to the petroleum industry. The purpose of ecological reconstruction is for the site to be returned to the environment for the resumption of economic and landscape functions, without presenting risks to the environment and human health. Decontamination technologies are based on various bioremediation methods. In many cases, significant amounts of soil are required to fill the resulting excavations and to systematize the land to complete the ecological reconstruction work. In the present study, the possibility to use sludge collected from a municipal wastewater treatment plant in the ecological reconstruction is presented. Both, the presence of hydrocarbon-degrading bacteria and the geotechnical characteristics make it possible to use the waste dehydrated sludge for the ecological reconstruction of the sites contaminated with petroleum products.

Key words: *contaminated site, decontamination, ecological reconstruction, sewage sludge.*

RESEARCH ON THE HEAVY METALS CONTENT IN SOILS FROM VARVOR LOCALITY, DOLJ COUNTY

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Abstract

In the current research, heavy metals content (Zn, Ni, Cd, Cu, Pb) was analysed in soil and corn cobs samples to determine if the soil and corn plants are polluted with these heavy metals, corroborated with the humus content, total nitrogen, mobile forms of phosphorus and potassium, soil reaction, clay, sand and silt. Soil samples were collected from 9 parcels located in the Varvor area. Varvor is situated in the SW of Dolj County, 18 km from Craiova, and positioned in the northeast part of the Desnatui Plain, on the border with the high Balacita Plain. Following the results, was found that all values obtained for these parameters are falling below the established normal values by Order 756/1997, for sensitive soils. Only concerning Cu content of the analysed soil samples, the limit value of 20 mg kg $^{-1}$ was exceeded for 6 of the 9 samples, the variation range being between 19.1-35.8 mg kg $^{-1}$. Heavy metals content in corn cobs were within the acceptable limits according to Codex Alimentarius, except for cadmium, which exceeded the limit value established by Commission Regulation no. 1881/2006.

Key words*: chemical, heavy metals, physical, properties, soil.*

AIR EMISSIONS INVENTORY FROM A ROMANIAN CONSTRUCTION MATERIALS FACTORY

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Abstract

The paper aimed to present the main methodologies for estimating atmospheric emissions, with an example for a construction materials factory. It is based on the statistical data provided by a pre-dosed dry mortar factory, for which both the emissions specific to the limestone quarry where the raw material comes from, as well as the emissions from the manufacturing process, were analyzed. The presented method, used for the elaboration of the emission inventory and not only, requires the use of specific emission factors for each emission-generating activity in an area or in a company. The method can be used for other purposes as well, including for calculating taxes to the Environmental Fund. Sometimes, due to legislative oversights or the impossibility of including a source in the existing list, it is up to the evaluator to choose the most correct approach.

Key words*: air pollutants, emission source, emission factor, emission inventory, Environmental Found.*

EVALUATION OF THE INFLUENCE OF GREEN SPACE IN THE PROCESS OF REDUCING URBAN NOISE, ON THE TRANSVERSAL PROFILES OF TRAFFIC ROADS

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Abstract

A special importance in designing the urban assemblies in cities, especially the configuration of the transversal profiles of the traffic roads, from the point of view of the acoustic and vibration protection for people, has the judicious design of the green spaces that are placed between the traffic roads and building front facades construction elements. Green spaces bring with a good contribution in the process of reducing urban noise, because of acoustic absorption characteristics they have. The relationship between the profile / size of urban road arteries in correlation with the size of adjacent green spaces and/or the distance from the running area to buildings can be evaluated from several points of view, including the effect of an earthquake. There were made research, in projects PN 23 35 01 01 and PN 23 35 06 01, by calculation studies regarding the values of the equivalent noise level, Lext (f), from traffic, - which were performed for a street-study profile, considered as a standard, then for other cases of study-road profiles. It was shown that for a traffic street of technical class 1 (with 8 lanes of traffic), bordered by two fronts of buildings of at least 8 floors high, having a complex composition of traffic, the two cases: without and with green area made by trees, shrubs and grass, indicates that values of transmission noise may decrease between 1 to 5 dB, depending on the winter and summer seasons.

Key words*: absorption coefficients, acoustics, civil buildings, green spaces/areas, urban noise.*

TOPOGRAPHY AND CADASTRE

MODERN AND PRECISE SOLUTIONS FOR MAKING ORTHOPHOTOS WITH THE TOPOGRAPHIC DRONE, NECESSARY FOR OBSTACLE STUDIES

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Abstract

The use of the drone offers the possibility of approaching surfaces that are difficult or even impossible to assess with the help of land surveying tools. With the help of professional drones, high-resolution images can be recorded for any type of terrain, with centimetric accuracy, regardless of whether it is an uneven surface, swamps, land where dangerous materials or substances are stored, forested areas or very large areas. Drone photogrammetry is a technique used to measure, metrically and graphically represent an area of land or other objects of interest, using aerial photographs. This photogrammetric method using drones is used to perform topographical measurements with centimetres accuracy and to make digital land models, topographic plans and many other applications for surveying and geodesy on large, drilled areas, agriculture, construction.

Key words*: orthophoto, precision, photogrammetry, topographic drone.*

GIS FACILITIES FOR THE AUTOMATION OF CADASTRAL DOCUMENTATIONS

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Abstract

This paper highlights a few ideas which lead to a significantly higher efficiency with regards to cadastral documentations. Each legislation change in the field of cadaster brings new challenges for a geodetic engineer. Although many software packages are available which partially automate the generation of various appendices of cadastral documentations, never before was there an attempt to fully automate the generation of a documentation. Taking into consideration the facilities offered by GIS tools especially, an attempt was made to make a major reduction of the time necessary to create a documentation. For the appendices which involve both numerical and alpha-numerical inputs, a very cheap and simple solution was proposed - Microsoft Excel; meanwhile, for the graphical parts of the documentation, which are the most important, an alternative which uses AutoCAD Civil 3D and ArcGIS was proposed. The method was tested on a sample of 47 cadastral documentations, which highlighted that the time involved in the completion of a cadastral documentation was reduced by a factor of 8.

Key words*: automation, cadastral documentation, GIS.*

THE APPLICATION OF COST-EFFECTIVE UAV SYSTEMS AND GIS SPATIAL ANALYSIS IN CADASTRAL AND CONSTRUCTION SURVEYING FOR BUILDING PLANNING

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Abstract

Architects and civil engineers struggle with building planning, construction, and maintenance uncertainty. Topography connects architecture and landscape; thus design and planning projects rely on monitoring, surveying, and field data. Unmanned aerial vehicles with digital cameras and structure from motion software are increasingly used in several sectors to build high-resolution digital elevation models. Despite its widespread use, most surveying projects believe that this technology produces inferior topographic representations due to legislation, environment, and weather constraints. While UAV systems have several drawbacks, their ability to acquire data from a different angle and provide outputs could revolutionize the construction business. Budget UAV systems can be used to construct a civil engineering survey approach. Thus, a supplemental UAV survey with spatial analysis in a geographic information system was built to enhance the deliverables. These include orthophoto maps, larger-scale and denser topographic representations, digital surface and terrain models, slope, aspect, and solar radiation maps that will aid building planning. The technique includes two case studies with varying terrain and vegetation constraints, an accuracy assessment, and a UAV implementation benefits discussion.

Key words*: land survey, mapping, UAV, photogrammetry, GIS, digital terrain model, construction planning*

COMPARATIVE STUDY ON DIGITAL IMAGE PROCESSING FOR 3D MODELING

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Abstract

The needs of today's society for urban planning require realistic 3D representations of objects or cities for various purposes. The topicality of the study is given by the fact that digital recording of cultural heritage objects represents one of today's society preoccupation for purposes such as maintenance, reproduction multimedia tools for education and dissemination, to artefact condition monitoring. Analysis in a virtual world, using 3D models, for historic buildings or ancient fortresses is much more efficient than a classical 2D analysis. Thus, the aim of this study was to make a comparison between processing digital images to obtain a 3D model of an object using, in the first case, a specialized, widely used software, and, in the other cases, different open-source specialized software. The object studied was the statue of General Ion Dragalina located in Dragalina Park in Caransebeș municipality, western Romania. To process the digital images, four specialized programs were used: Agisoft Metashape, 3DF Zephyr Free, Regard 3D and Meshroom together with Meshlab. Finally, the advantages and disadvantages of each of the programs studied are highlighted by comparison.

Key words*: cultural heritage; 3D representations; historic buildings; 3D models; digital recording.*

EARTH OBSERVATION AND GEOGRAPHIC INFORMATION SYSTEMS

APPLICATION OF GIS IN MANAGING THE AGGREGATE COMPOSITION OF THE SOIL WITH A NEW ACTIVE WORKING BODY FOR SURFACE TREATMENT

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Abstract

The fertility of the soil depends on its conditions, which are quantitatively expressed through its properties of porosity, density, and humidity. The change in these properties is due to its structural construction and the environmental impacts. A part of the soil is damaged by heavy metals, improper fertilization and threatened by erosion. In this research proposal, innovative working bodies will be investigated for soil treatment, with the aim of managing the aggregate composition and predicting fragmentation, to protect it from erosion. The aim of the study is to application of GIS investigate innovative working bodies with active drive, to achieve a higher quality of surface tillage considering the existing external and controllable factors. Statistical processing of the results and optimization lead to the various operating modes of a machine to achieve the main idea and the resulting soil fragmentation regression equations are entered into a GIS environment. The Surface soil treatment is managed by GIS tools for variety visualization and presented statistically the most suitable information. The implementation of working bodies in practice will enrich the soil fragmentation data base, which leads to a greater choice of tillage bodies for soil erosion control.

Key words*: GIS, soil treatment, soil fragmentation.*

EARTH OBSERVATION TECHNIQUES APPLIED FOR LAND WASTE DETECTION AND MONITORING

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Abstract

The dramatic increase in the amount of waste produced globally has an undeniable negative effect on the environment. The accelerated pace of urban development, the increase in consumption and the large scale of industrial activities have led to a rapid accumulation of waste in proper waste dumps. All member states of the European Union are required to comply with waste management regulations, which primarily provide for the prevention of illegal dumping of any type of waste, its disposal in compliant landfills and their regular monitoring.
In our ongoing project we aim to support waste management activities by proposing practical ways for Earth observation data to be used in off-site waste detection and monitoring of known landfills.
Our research focuses on assessing the state of the art in earth applications techniques such as artificial intelligence/ machine learning that are currently being used for waste management and proposing approaches for building up a portfolio of scalable solutions that will support waste management not only in Romania but also at a regional, European, or global level. "This work was supported by a grant of the Ministry of Research, Innovation and Digitization, CCCDI - UEFISCDI, project number PN-III-P2-2.1-PTE-2021-0432, within PNCDI III".

Key words*: Deep Learning, Earth Observation, illegal waste dumps.*

AN ANALYSIS OF THE EVAPOTRANSPIRATION IN THE ARGES RIVER BASIN USING MODIS MOD16A2

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Abstract

This work presents an analysis of the evapotranspiration in the Arges River Basin, including a riparian system located near Dragomiresti village, using MODIS Global Terrestrial Evapotranspiration 8-Day Global (MOD16A2) at 500-m pixel resolution to assess the amount of water lost from the hydrologic budget. The period of coverage is 8 days during the vegetation season of the considered period (2015-2022). The geospatial analysis of the selected riparian systems was performed with ArcGIS Desktop 10.8.1 and Google Earth Engine. Argeș River supplies water for several important Romanian cities, and thus, the rationale of this work relies on the characterization of evapotranspiration for potential better management. Riparian vegetation has multiple functions and provides a wide range of ecosystem services of which yields are directly influenced by the river basin`s ecological status. Limiting anthropogenic disturbance is important for the health of lotic ecosystems. The utilization of MODIS does not provide fine-scale resolution (<10 m), making it difficult to discriminate between phytosociological associations at a small scale and thus establish the riparian systems' typology and associated vegetation indicators. Downscaling and data fusion methods will be further explored.

Key words*: MODIS, MOD16A2, riparian grasslands, riparian systems, geospatial analysis, ecological efficiency, Google Earth Engine.*

NOISE POLLUTION: A GIS-BASED APPROACH TO MAPPING AND ASSESSMENT

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Abstract

Monitoring noise pollution is crucial for protecting public health and the environment. It provides data and information needed to understand the sources and distribution of noise levels. This paper presents a GIS-based study of noise pollution for an area located in the southwest part of Bucharest, between Mihail Sebastian, Calea 13 Septembrie and Drumul Sării streets. The values of noise have been recorded by using the Sound Level Meter Lutron - Model SL-4012, in September 2022, for 3 different moments: in the morning, at midday, and in the evening. The results of the analysis have been then used to produce noise maps for each of the three locations. The results showed significant differences in noise levels across different times of the day, with peak levels occurring during daytime hours and early evening in different locations. The study's noise maps provided a clear visual representation of the distribution of noise levels, highlighting areas of concern. The study presents the importance of considering temporal factors in noise mapping and assessment, and the benefits of using GIS tools for this type of analysis.

Key words*:* GIS-based mapping, noise pollution, road traffic noise, SLM-Sound Level Meter.

ASSESSMENT OF THE EUROPEAN GROUND MOTION SERVICE ORTHO PRODUCTS FOR LANDFILL SYSTEMATIC OBSERVATION

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Abstract

The European Ground Motion Service (EGMS) is a new, open and freely available addition to the pan-European component of the core Copernicus Land Management Service (CLMS). The service offers very accurate and consistent information regarding the ground motion velocity that might be correlated with a wide range of circumstances, such as landslides, subsidence, volcanic activity and many others. The products (i.e., basic, calibrated and ortho) delivered by EGMS were generated based on Sentinel-1 time-series acquired between 2016 and 2020, using Persistent Scatterer Interferometry (PS-InSAR). The present study addresses the suitability of the EGMS ortho products for the monitoring of 15 solid waste landfills located across the territory of Romania. The vertical displacements extracted for each selected landfill were analysed and correlated with the available background information (e.g., the duration of exploitation, the quantity of waste disposal per year, etc.). The study proved that EGMS might be an important tool for waste management since it enables the continued monitoring of the landfill settlement process.

Key words*: European Ground Motion Service, Persistent Scatterer Interferometry, Sentinel-1, landfill monitoring.*

DIGITAL CONSERVATION OF HERITAGE BUILDINGS USING A UAV SYSTEM CONFIGURED FOR LATERAL SCANNING AND IMAGES, COMBINED WITH A HYBRID PROCESSING METHOD

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Abstract

The preservation of heritage buildings is essential in a modern society that understands the importance of architecture, culture, and history. The lack of reconstruction funds or the vision of the decision-makers can delay the realization of the works to protect these buildings. The digital conservation of these buildings can be a solution for a later reconstruction or for the creation of a realistic virtual museum. The article presents the rigorous setup and calibration of an airborne side scanner mounted on a UAV platform. Acquiring fine architectural details involves the use of more precise scanning sensors, with substantially higher costs, leading to delays. The present study shows that medium precision scanning sensors can also be used for digitizing architectural details. The side scan solution can be applied successfully in the digital preservation of buildings with a medium degree of detail, but it can also be useful in complex cases. Using optimal processing methods greatly improves the internal accuracy of the modelling with little loss in accuracy. The proposed methodology can be applied even when using superior sensors, leading to exceptional results.

Key words*: Digital Modelling, Lateral Scanning, UAV, LIDAR, Heritage, Hybrid Processing.*

SAR-BASED SUBSIDENCE MONITORING IN URBAN AREAS DUE TO GROUNDWATER WITHDRAWAL FOR AGRICULTURE: A REVIEW WITH DEMOGRAFIC INDICATORS ASSESSMENT

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Abstract

Intensive groundwater withdrawal is one of the main causes leading to land subsidence in the natural and urban environments. The overexploitation of groundwater in urban areas comes mainly in the context of rapid urbanization, expansion of industrial and agricultural activities, and in some cases, climatic changes. Sustainable urban planning and detection of potential hazards involve the use of adequate instruments such as the continuous monitoring of land subsidence. The satellite remote sensing Synthetic Aperture Radar Interferometry (InSAR) techniques offer the opportunity for early detection and continuous monitoring of land subsidence for wide areas, including urban centres. Considering various aspects, a review of scientific contributions where urban subsidence due to the intensive groundwater withdrawal for agricultural purposes is monitored based on InSAR techniques, is presented. As land subsidence in urban areas has a direct impact on the quality of life, the review is completed with demographic indicators assessment, followed by analysis on the dynamics of the population in some urban areas affected by land subsidence.

Key words*: InSAR, groundwater-related subsidence, urban, agriculture, demographic indicators.*

MONITORING THE VEGETATION STATE IN OLTENIA PLAIN, USING COPERNICUS LAND PRODUCTS

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Abstract

The development of Earth Observation Systems in Europe began since the 1970s. France, through the National Center for Space Studies (CNES) together with partners from Belgium and Sweden and later through the establishment of Spot Image, laid the foundations of the SPOT space program. The year 1998 brings the first steps of a new common space program of the EU countries by the appearance of the GMES (Global Monitoring for Environment and Security) initiative. In 2014 GMES changed its name to Copernicus and is coordinated and managed by the European Commission, in collaboration with European Space Agency for the space component, European Environment Agency and Member States for the in-situ component. An important step in the study of vegetation was made with the emergence of the SPOT-VEGETATION program based on SPOT 4 and 5 from 1998 to 2013, followed by Proba-V from 2013 until 2020 and continued today by Sentinel-3. Vegetation indices are widely used for assessment of green biomass, crop production, plant health and stress to water scarcity, extreme weather conditions, and diseases.

Key words*: Copernicus, CGLS, Proba-V, Vegetation state.*

EXTREME AGROCLIMATIC INDICATORS PROJECTION UNDER CLIMATE CHANGE IN OLTENIA PLANE

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Abstract

The warming of the climate system is a reality, with observations indicating increases in global average water and ocean temperatures, extensive melting of snow and ice, and global average sea level rise. It is highly likely that much of the warming can be attributed to human-caused greenhouse gas (GHG) emissions. Over the past 150 years, the average global surface temperature has risen by almost 0.8°C overall and by 1°C in Europe. The average global temperature in 2020 was almost identical with 2016, considered the warmest year on record. Continuing the planet's long-term warming trend, the 2020 annual average temperature was 1.02°C higher than 1951-1980 reference average, according to NASA. 2020 slightly exceeded 2016 values, which were within the error boundaries of the analysis, making the two years the warmest on record in modern history. Here we analyse projected changes over one of the most important agricultural areas for Romania with focus on extreme agroclimatic indicators analysis.

Key words*: climate change, C3S, extreme agroclimatic indicators, climate projection.*

SUPERIOR PHOTOGRAMMETRIC PRODUCTS USING DIRECT GEOREFERENCING, LIDAR DATA AND PRECISE TRANSFORMATIONS

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Abstract

The current research presents the way to obtain direct georeferencing of photogrammetric imagery and to obtain rigorously georeferenced orthophoto plans without using ground control points. The direct georeferencing procedure is studied in Romania`s atypical coordinate systems (planimetric system based on an ellipsoid different than GRS80 and a vertical system of normal elevations, different than the ellipsoidal elevations used in GNSS technology), but it can also be applied to other systems of coordinates. To generate superior photogrammetric products, an innovative orthorectification methodology based on LIDAR data acquired simultaneously with photogrammetric images is presented. LIDAR data is also acquired by a direct georeferencing procedure and transformed with high precision using an application designed for this purpose. Therefore, a much faster way to generate orthophoto plans is presented, with lower production costs, without a substantial loss of the positional quality of the final product. Finally, there is presented the first stereo restitution project in Romania using small size images, acquired with a UAV system by direct georeferencing. The focus on the atypical case of Romania underlines the innovative features of this research.

Key words*: direct georeferencing, orthorectification, LIDAR, UAV Stereo restitution.*

STUDIES OF BONITATION AND LAND EVALUATION IN MURFATLAR, CONSTANȚA COUNTY, ROMANIA, USING GIS TECHNIQUES

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Abstract

This paper aims to present the land quality and productivity of the administrative territorial unit of Murfatlar, Constanța County, located in south-east of Romania, an area well known for its vineyards, while used for specific purposes, such as agricultural destinations. The assessment is based on the analyses of climate (temperature and precipitation), soil (type, texture, reaction, gleization, presence of microforms and water), relief (slope), as well as other aspects of land, and their interpretation to determine the fertility of the site and its pretability for cultures. For the results and discussions phase, the soil bonitation note was calculated and a qualitative classification map was made to illustrate the potential productivity level. However, because the soil evaluation is developing under both natural and human-caused environmental changes, the bonitation note needs to be revised often.

Key words*: land quality and productivity assessment, bonitation, suitability, Geographic Information System, classification.*

MISCELLANEOUS

AN OPTIMIZATION MODEL FOR THE DELIVERY OF PLANTS TO NURSERIES

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Abstract

The purpose of the development is to present an option for reducing costs in the delivery of ornamental plants to nurseries. The nursery is located in the town of Parvomai and is located in the eastern part of the Plovdiv region, in the Thracian plain, at about 134 meters above sea level. Different varieties of flowers are produced in it – petunias, violets, verbena, tagetis, sakezets and other species. The nursery stocks and delivers goods to 5 small sites in the surrounding area To achieve the goal, the following tasks must be solved: to characterize the used vehicles; to optimize transport costs by solving a transport task under certain conditions. By using MS Excel Solver, proposed algorithm for describing a transport task and its subsequent solution, significantly speeds up the calculation procedures and helps to reduce costs when making deliveries.

Key words*: optimization model, transport task, Solver.*

SCENARIO-BASED ON LEARNING ACTIVITIES DESIGNED TO PROVIDE INTERACTIVE EXPERIMENTAL LAB AT SCIENCE DISCIPLINES

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Abstract

Even if online and distance learning options were accessible before COVID-19 it wasn't appreciated and incorporated properly within educational process. The unwelcomed situation created by COVID-19 pandemic it has brought a lot of uncertainties, challenges and set a milestone for online educational process. In the context of suspended face-to-face activities, teachers had to solve a great challenge: to teach online experimental activities at science disciplines. Hence, everyone had to adapt and to found in a short period of time the best solutions. If delivering theoretical aspects was easier to implement, experimental activities became quite provocative at that moment. This paper presents solutions that we found and implemented in our science classes during COVID-19 pandemic period and the new perspectives that arose from this experience. Considering that online learning represents a powerful educational solution and having in view possible future emerging situations (pandemic, extreme climatic conditions etc) that may affect face to face learning, we intend to develop and implement in our science disciplines a virtual laboratory under the name "Hybrid Environmental Engineering Laboratory for exercising practical skills".

Key words*: education; online learning; virtual laboratories (VLs).*

COMPARISON STUDY BETWEEN A CONCRETE FRAME STRUCTURE AND A MASONRY STRUCTURE FOR A FIVE-STOREY BUILDING

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Abstract

The current study focuses on the structure cost and the energy efficiency for a five-storey building located in Timisoara, Romania. A cost comparison and the energy demand between two types of structures was concluded, namely a concrete structure and a masonry structure. The study focuses only on the building's structure because the building's finishes and the installation are the same for both cases. Regarding the energy efficiency, the difference appears for the exterior walls, in the first case, for the concrete structure building the walls are realized with autoclaved cellular concrete (ACC) and in the second case for the masonry structure the exterior walls are realized with brick masonry. The walls insulation is the same in both cases.

Key words*: cost comparison, frame structure, masonry structure.*

COMPARISON STUDY BETWEEN A PITCHED ROOF AND A FLAT ROOF FOR A 2-STOREY HOUSE

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Abstract

The purpose of this study is to see the differences between the investment costs and the energy efficiency for two types of roofs for a 2-storey house located in Timisoara, Romania. The paper contains a comparison of the costs and energy demand between a pitched roof and a flat roof. The energy demand will be calculated using the stationary method with a modelling program. The study focuses only on the effects of choosing between the two types of buildings roofs, so the dimensions of buildings, characteristics of the buildings envelope (exterior walls, windows and doors, ground floor slab) and the installation systems remain the same.

Key words*: energy efficiency, pitched, flat, roof.*

DIFFERENTIALS AND APPLICATIONS TO FUNCTION APPROXIMATIONS

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Abstract

In mathematics, the term "differential" refers to several related notions derived from the early days of mathematical analysis, which became rigorous later, such as infinitesimal differences and the derivatives of functions. The notion is used in various areas of mathematics such as algebraic geometry, algebraic topology, calculus, differential geometry etc. The term differential is used non rigorously in calculus referring to an infinitely small ("infinitesimal") variation change in a quantity. For example, if one considers x as a variable, then a "bigger" change in the value of x is often denoted by Δx. The differential dx is an infinitesimal change of the variable x. The concept of an infinitely small or infinitely slow change is very useful, and there are a several of mathematical tools to make it precise. Using calculus, it is possible to relate the infinitesimal changes of several variables to each other using function derivatives.
In this article we present the notions of Gateaux and Frechet differentials of a multivariable function with their properties, geometric interpretation and applications to function approximations.

Key words*: differential, multivariable function, function approximation.*

ASSESSING CHARACTERISTICS OF MICROBIAL COMMUNITIES IN SOILS FROM HIGH NATURAL VALUE AGRICULTURAL SYSTEMS FROM CARAS-SEVERIN COUNTY

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Abstract

Romania owns important areas with High Natural Value (HNV) agriculture systems. The aim of the paper was to assess the biodiversity aspects of microbial communities in two soils from the areal selected for HNV payments, that belongs to the Pilot Zone II in Lupac, Caras-Severin County: P3-cultivated in conventional system with maize for forage and P4-under HNV agriculture system with forage plants, mainly leguminous, between abandoned orchard trees. Microbial counts and taxonomy of bacteria and fungi have been determined (by dilution plate method). Diversity index of Shannon and similarity index between the habitats have been calculated, as well as soil respiration potential (estimated by substrate-induced respiration method). Microbial diversity varied from 3 to 9 species. Dominant species included Pseudomonas fluorescent, Bacillus spp. and cosmopolitan genera Penicillium and Trichoderma, with role in improving the control of phytopathogens in rhizosphere and nutrients uptake by plants, aggregation of soil, cellulose decomposition and carbon sequestration. Circular paper chromatograms provided information on biological quality of studied soils.

Key words*: HNV agriculture system, biodiversity, bacteria, fungi, paper chromatograms.*

INTEGRATED SYSTEM FOR THE COMPLEX ENVIRONMENTAL RESEARCH AND MONITORING IN THE DANUBE RIVER AREA – REXDAN

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Abstract

The multitude of environmental threats identified in the last decades and the necessity of improving climate change resilience impose massive investments. Therefore, it is a real necessity for establishing new integrated research infrastructures that target research directions in environment protection, climate change and the optimal use of non-conventional water resources. As a response to the above-mentioned desideratum, an Integrated Infrastructure for the Complex Environmental Research and Monitoring in the Danube River Area, named REXDAN, was established, as part of "Dunarea de Jos" University of Galati, Romania, having as primary goals the increase of research capacity, in the field of intelligent specialization energy, environment, climate change, within the Danube River basin. REXDAN has two components, as follows: an inland research center and a research vessel, with a total of 18 laboratories. In conclusion, it can be stated that REXDAN is able to perform complex research at high standards, managing to represent one of the European most important research entities in environmental research and climate change, being able to promote Romanian scientific innovation through international cooperation with European and international research teams.

Key words*: REXDAN, environmental research, Danube River, integrated monitoring system, "Dunarea de Jos" University of Galati.*

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