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# **BOOK OF ABSTRACTS**

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# **RELATIONS BETWEEN THE MORPHOMETRIC CHARACTERISTICS OF THE RELIEF AND THE LANDSLIDES IN THE CUBOLTA HYDROGRAPHIC BASIN, REPUBLIC OF MOLDOVA**

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Among the processes that predominate on the territory of the Cubolta river basin are the landslides, which affect about 2071.86 ha of the entire surface of the basin. Because landslides occur as a result of factors that contribute to their onset, for example, the morphology and morphometry of the relief, an attempt was made to highlight the relationship between the morphometric elements of the relief and the landslide process. Due to the usefulness of the calculation functions of the ArcGis software, it was possible to represent graphically the relationship of the morphometric parameters and the landslides existing on the researched territory.

## **THE INDUSTRIAL BROWNFIELD SITES AND THEIR ECONOMIC CAPITALIZATION**

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Urban regeneration by converting brownfield sites can make a real difference in the development of Romanian cities. This fact, which has proved effective and sustainable in Western countries (preventing the decline of urban centers), is all the more important in Romania, where the model of development of cities from the period before 1990 envisaged the construction of industrial areas around those with residential offices, commercial, etc.

De-industrialization has been a real challenge for Romanian cities, in a situation where the factories providing jobs have, in turn, started to stop working. With this process, the areas where the factories were built, the so-called industrial areas, have entered a wide-ranging and rapid process of destruction. Moreover, the legal vacuum in the protection of industrial heritage has led to irreparable losses of the industrial architecture.

This study aims to analyze the use of brownfield sites in the city of Iasi, whose industry has been severely affected by the profound trends over the last 30 years. The results showed the predominant use of former industrial

areas for real estate purposes, without concern to preserve buildings with real architectural value. Three case studies (one from the heavy industry and two from the light industry) underline the above.

We conclude that in Romania (with some notable exceptions), and especially in the city of Iasi, there is no clear desire/tendency to preserve the urban industrial heritage, rather, it is to transform the premises of former factories into residential and office neighborhoods, i.e. an easy, fast and financially profitable recovery without new projects preserving/capitalizing heritage buildings.

## **THE ROLE OF THE ACTIVE INTERVENTIONS INTO THE ATMOSPHERE IN THE CONTEXT OF CLIMATE CHANGE**

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Releasing a significant amount of greenhouse gases into the atmosphere, such as carbon dioxide and methane, we expect to see more severe extreme weather phenomena with harmful effects on society and economic activities. To suppress or mitigate the damages due to extreme weather phenomena, besides framework directives that impose a lowering or complete removal of the greenhouse gases, by interest many programs about active interventions into the atmosphere. These are associated with measures that include hail suppression, rainfall enhancement, fog dissipation, and mitigating the risks associated with early and late frost phenomena. In Romania, the main activity linked by Active Interventions into the Atmosphere (A.I.A.) by Law 173/2008 is hail suppression by anti-hail rockets technology. In the future, besides hail suppression, it is desired to enact rain enhancement and uniformity of the rainfall. Based on the research conducted within U.C.C.G. Moldova 1 Iasi, there was noticed a lowering of the risk shown by the hailstone once the convective cells were seeded. Also, the clouds seeding with silver iodide (AgI) have increased rainfall within the protected areas, up 20 to 25% compared with the neighboring regions. In the future, for rain enhancement at the national level with aviation technology, importance, the results achieved following the experiments made in the southeastern part of Romania as a part of “The local experimental program at small scale for rain enhancement in the

Banat Region, the western part of Oltenia, and northeastern part of Romania”, during the years 2019 and 2021.

## **ECO-CULTURAL NICHE MODELLING OF THE CUCUTENI-TRYPILLIA GROUPS IN EASTERN EUROPE**

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One of the most applied tools for documenting cultural variability and tracing the cultural trajectories within the environmental context is Eco-Cultural Niche Modeling (ECNM) and their associated methodology. The ECNM has been adapted by archeologists and not only from the bio-computational architecture to explore the interactions between cultural and natural systems and to understand how ecological dynamics influenced adaptations and movements of prehistoric populations. Therefore, even if the concept of Ecological Niche Modeling (ENM) is derived from the Biology disciplines and commonly used in biodiversity or geographic ecology studies, the ECNM applies the same methodology to analyses archaeological record and prehistoric human culture via GIS software's. Also, the niche breadth characterization offers the opportunity to evaluate quantitatively the links between a given adaptive system and ecological constraints which provides valuable information for archaeology. In this work, ten independent climatic and topographic environmental variables were interpolated and ECNM techniques were used to determine whether these differences in the geographic distributions and niche breadth are consequences of differences for five Cucuteni-Trypillia groups which flourished in Eastern Europe during the Eneolithic (cal. 5,400/5,300 - 2,800/2,700 BCE). The outcomes show that the eco-cultural niches of Cucuteni-Trypillia groups is significantly overlapping and the expansion trend of the cultural groups from Eastern Carpathians lowland into the northeastern steppe regions was not due to ecological niche differences but rather a result of other cultural factors. Furthermore, we highlighted that the populations of first Cucuteni-Trypillia groups had slightly more restricted ecological niches in the mid-Holocene ecosystems than Late Eneolithic groups. The results have significant implications to understand the geographical range and distribution of the last great Chalcolithic society of Old Europe and contribute to the characterization of ecological niches they have exploited during the cultural evolutionary process.

## **THE ROLE OF PORTS IN DEVELOPING DANUBE CITIES: PERSPECTIVES AND FUTURE POSSIBILITIES**

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Over time, the Danube has been a significant transportation hub, with a key role in developing a specific category of urban settlements: port cities. Several factors influenced the expansion of these cities, each with a different intensity and impact. Based on the historical context, port cities have experienced both times of evolution and periods of decline. Danube had major importance since the medieval period, but now they are facing economic difficulties. This paper aims to analyze two port cities in Romania by highlighting the role of ports and related activities in the economic development of cities. The port cities of Galați and Brăila were chosen as case studies; in these cities the role played by their ports as engines of development in the two cities was investigated. The study has three objectives: identify the factors that affected the development of port cities, pinpoint the present economic situation for the two selected case studies, and highlight future development prospects and opportunities by accessing European funding. The analysis revealed that after 1990, the change of political regime and transition to an open market economy affected the economic situation in the two cities studied. Nowadays, ports have much smaller importance in the economies of both studied cities. Few companies influence the port traffic: the Sidelurgic Plant and the Shipyard in the Port of Galați, and the Shipyard in the Port of Brăila. The analysis also identified examples of industrial units that depended on navigation, but were closed, reducing port traffic. However, Galați and Brăila did not take advantage of the opportunities offered by the Danube. These ports are part of the TEN-T network along the Rhine-Danube corridor. This network is an advantage because of the access provided to EU funding. Given the infrastructure problems of analyzed cities, the TEN-T network is an opportunity to improve connectivity. So far, the two cities in question have no airport or express road to link them, despite the existence of many plans drafted by local and central authorities. Another opportunity is represented by the Danube Bridge from Brăila, due in 2023. This bridge was supposed to play a significant role in the entire region by facilitating connections between Brăila, Galați, Tulcea, and Constanța.

## **A STUDY FOR APPLICATION OF THE METHODOLOGY FOR DELIMITATION OF THE MINOR RIVERBED**

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The Romanian legislation regarding the delimitation of minor riverbeds provides uniform rules for defining the notion of minor riverbed, as well as for regulating the concrete ways of establishing the limits and delimitation in land of the minor riverbeds of surface waters in public ownership of the state. For non-permanent frontal accumulation lakes, the surface of the minor riverbed is assimilated with the surface occupied by water along the entire length of the accumulation basin, at the level corresponding to the transit of the maximum flow with the annual probability of exceedance 50%, representative for characterizing the current flow regime. Within this paper, a case study was carried out for the non-permanent accumulation Ciurea, located on the Nicolina River, in Iași County.

## **USING LOGISTIC REGRESSION AND BIVARIATE STATISTICS TO ESTIMATE THE FLOOD SUSCEPTIBILITY IN TROTUȘ RIVER BASIN, ROMANIA**

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Flash floods are becoming an increasingly recurrent natural hazard globally. Romania has been devastated severely by heavy floods. Storms that cause heavy floods in mountain and hilly river catchments are generally triggered by heavy rainfall. In addition to temporal flash flood forecasting, models for recognizing risky places may greatly contribute to disaster risk reduction and policymaking. The need for more precise modes has arisen as a result of flash flood hazard mapping. Hence, the present research proposes four state-of-the-art hybrid models for the simulation of flood hazard potential in the basin of the Trotus River in Romania. Logistic Regression and Weights of Evidence are the algorithms used to achieve the results. As input data, we used 12 flood-influencing factors and 172 flood locations. This sample was split into training (70%) and validating (30%) datasets. Using the training points, for each class/category of flood

predictors, coefficients were calculated by using the WOE. The models revealed that a percentage between 16.22% and 25.84% of the Trotuș River basin has high and very high values of flood potential. The findings of this research may substantially map the risky areas and further aid watershed managers in limiting and remediating flood damage in the data-scarce regions.

## **MONITORING OF AMBIENT AIR QUALITY IN THE CONTEXT OF COVID-19 PANDEMIC**

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Ambient air pollution, with consequences to the environment, human health and climate change, affects regions around the world. However, with the lockdown imposed during the COVID-19 epidemic, reductions in nitrogen dioxide (NO<sub>2</sub>) concentrations - one of the main urban pollutants - have been reported in many parts of the world, by 70% and 80% in Barcelona region, 64% in other cities in Spain, about 40% in London and New York, and about 60% in New Delhi region. In this context, the present paper shows the results of monitoring NO<sub>2</sub> concentrations within the INCERC Bucharest Branch, located in the eastern part of Bucharest, Romania.

Monitoring of NO<sub>2</sub> concentrations was performed in three stages: the period before the state of emergency (February-March 2020), during the first month (March-April 2020) and the second month of it (April-May 2020). The model HAZ-SCANNER EPAS, manufacturer SKC - United Kingdom, was the equipment used for monitoring ambient air quality, acquired under the project PN 19 33 04 02 - Sustainable solutions to ensure the health and safety of the population in concept of open innovation and environmental protection. The monitoring method consists in the qualitative and quantitative identification of the inorganic compound NO<sub>2</sub> using the electrochemical principle and the recording continuously of its concentrations, at interval of 1 minute.

The experimental average values of NO<sub>2</sub> concentration, obtained before the state of emergency, was of 36.1ppb, with a minimum of 11.6ppb and a maximum of 57.9ppb. In the first month of the state of emergency, it was of 13.6ppb, with a minimum of 3.0ppb and a maximum of 28.7ppb. Meanwhile, in the second month, the average was of 15.5ppb, with a minimum of 4.7ppb and a maximum of 41.7ppb. The analysis of the above-

mentioned values of NO<sub>2</sub> concentrations indicated a decrease in the NO<sub>2</sub> concentration during the two months of the state of emergency, both of the minimum values recorded and of the maximum and average values, the decrease of the average values being of 62.3%, in the first month and of 57.0%, in the second.

The outcomes on declining concentrations of one of the major external pollutants may seem positive, but air quality remains an issue that requires long-term attention from communities, as air pollution affects million people worldwide each year. The conclusion is clear: it is possible to implement major interventions in cities for health reasons, as well as changing priorities so that maintaining clean ambient air becomes a key concern.

## **ACHIEVING SUSTAINABLE RESIDENTIAL AREAS AND NEIGHBOURHOODS IN ROMANIAN CONTEXT. THE LINK BETWEEN URBAN DEVELOPMENTS AND QUALITY OF LIFE**

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The concept of sustainable development in residential areas in Romania is usually seen as a technical issue, implemented using specific technologies and materials. The current paper addresses the human side of building sustainable residential areas and neighbourhoods by focusing on the impact of urban form on the quality of urban life. From politicians to entrepreneurs, from housing rights activists to real estate agents, quality of life is used as an argument to promote city projects. Although different fields do not define it directly, each one has its own understanding of the concept. The different definitions and understandings have implications for measuring the quality of life. This paper presents a review of the national and international scientific literature dealing with the concept of quality of life, starting from its sociological definition and offending with its urban planning understanding. The underlying hypothesis is that urban form can directly impact the quality of life. This understanding of the concept from an urban design perspective can be used to contribute to the analysis and definition of quality of life. Based on the scientific literature, quality of life

is a multidimensional index consisting, from an urban planning perspective, of the quality of urban life. This sub-concept can be used in designing residential areas and neighbourhoods that do not only achieve specific technical and economic objectives, but also address social issues. Currently, in the Romanian media and cultural discourse, the success of urban developments is measured mainly by achieving economic goals for private investors. However, internationally in addition to the economic issues, the urban positivist discourse considers cities and implicitly residential areas as a solution to the current economic, social, and environmental crises. Taking this context into account, urban quality of life can facilitate the design and development of sustainable residential areas and neighbourhoods in Romania by incorporating the concept in urban planning regulations. This paper is part of the PhD research titled "Improving urban regulations in order to increase the quality of life in residential areas in Romania" under the supervision of Professor Architect Adrian Iancu, PhD, within the Doctoral School of Urban Planning at "Ion Mincu" University of Architecture and Urbanism in Bucharest, Romania.

## **ISSUES ON THE DYNAMICS OF GENERAL MORTALITY OF THE POPULATION IN THE NORTHERN DEVELOPMENT REGION (REPUBLIC OF MOLDOVA)**

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The study is an analysis of the population mortality dynamics in the Northern Development Region (RDN) of the Republic of Moldova over the last ten years. Population mortality is one of the main parameters of the population's health, which is directly or indirectly reflected in the demographic process influencing the birth rate, natural increase, life expectancy, marriage, etc. As a demographic phenomenon, mortality is the sum of all deaths recorded in a given period for a given population. Following the analysis, the average value of the general mortality of the population in the RDN is 1288 cases per 100 thousand inhabitants. The highest mortality rate is attested in Donduseni district with 1675 deaths per 100,000 inhabitants, followed by Briceni district - 1496 cases / 100,000 inhabitants, Edineţ district with 1437 cases / 100,000 inhabitants; and the lowest level is registered in Soroca district - 1255 cases/100,000 inhabitants and Sîngerei district with 1105 cases. Bălţi municipality records the lowest values, for the evaluation period, with an average of 898 deaths per 100

thousand inhabitants, at the same time, being with approx. 12% higher compared to other municipalities in the country and about 14% compared to the values recorded in the territory of RD Chisinau. At the national level, the general mortality of the population is estimated at 1100 cases per 100,000 inhabitants; the total average on the municipalities of the Republic of Moldova is - 803 cases / 100,000 inhabitants; and on RD Chişinău municipality registers the lowest values for the estimated period and constitutes 786 cases / 100,000 inhabitants. We note that the mortality rate of the population in the RDN has higher values compared to the Central Development Region (RDC) and the Southern Development Region (RDS), as well as the value per republic. Compared to the general mortality of the population in the RDC and RDS, the value in the RDN is about 10% higher (RDC - 1153 cases / 100,000 inhabitants, RDS - 1135 cases / 100,000 inhabitants), and compared to the national value, it is approx. 17% higher.

**GOVERNING COASTAL RISKS: MORPHOSPATIAL ANALYSIS  
OF THE RISKS OF MARINE SUBMERSION OF THE BORDER  
STRIP OF DAR BOUAZZA COASTAL URBAN AREA SOUTH OF  
CASABLANCA (MOROCCO)**

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The choice of Dar Bouazza's coastline is imposed by its territorial interests (ecological, tourist, urbanistic...etc.). It has become over time, one of the most attractive coastal environments within the metropolitan area of Greater Casablanca. Currently, this coastal urban space is undergoing a fairly sustained urbanization of its waterfront. It is a coastal right-of-way, whether in the urban perimeter or on the periphery (urban-rural interface), the most exposed to the risk of marine submersion by storm or tidal wave. The proposed simulation foresees three scenarios of marine submersion, whose submerged right-of-way varies according to the amplitude of the swell (more than 5m, more than 10m and more than 20m). The whole set has been integrated into a spatially referenced database in order to spatialize the potentially submerged coastal rights-of-way. In this territorial context marked by strong urban change, the future of sustainable development of the said ecological fringe is essential. Research must be oriented towards a resilient and sustainable approach to better govern

coastal risks within the study area, by establishing the principle of the natural break or ecological corridor along the coastal line, playing the function of the buffer zone.

## **PRINCIPLES OF ESTIMATING SOIL MOISTURE PARAMETERS IN THE BASIN**

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In the vertical structure of the river basin, the dominant formation is the soil. Conditions for the transformation of water supply to the surface of the basin are determined by the ability of the soil to give or, contrarily, retain a significant proportion of precipitation. The soil column in the process of formation of the flood hydrograph performs the functions of moisture transfer by two opposite signs of the vertical component: filtration and evaporation. The laws of infiltration were considered by us in the previous section, where it was found that the leading parameter of the infiltration process in addition to the intensity of rain is the filtration coefficient.

There are many methods for determining evaporation from the soil, such as the methods developed by Konstantinova, Polyakova and Kuzina. We shall consider two methods for the sake of an example. The first one is an equation to determine evaporation by M.I. Budiko edited by Marchenko:

$$W_k = \frac{W_h(1 - bE_0/2y) + P + K + M - Y - I}{1 + bE_0/2y}, \quad (1)$$

where  $W_k$  and  $W_h$  – are initial and final reserves of moisture in the root layer of the soil,  $b$  – is a biological coefficient, which depends on the phase of plant development;  $E_0$  - evaporation;  $y$  – the productive value of the lowest moisture content;  $K$  – groundwater recharge;  $P$  – precipitation;  $M$  – deficiency of soil moisture to a condition of saturation of productive moisture;  $Y$  – surface runoff;  $I$  – infiltration beyond the root layer of the soil. All values (except  $b$ ) are given in millimetres. The calculation according to equation (1) is carried out at time intervals, which are taken equal to the decade, the value  $W_h$  for this decade is taken equal to the value for  $W_k$  of the previous one.

The second method is quite simple in structure. It is the method of A. Budagovsky. It was slightly modified by Y.B. Vinogradov based on Dalton's law.

$$\frac{dE}{dt} = A(e_s - e) \quad (2) \quad \text{as:} \quad E = k[W_m - W_e] \quad (3)$$

where  $E$  – evaporation from the soil,  $k$  – turbulent diffusion coefficient of humidity,  $W_m$  – maximum soil moisture,  $W_e$  – real humidity.

$$W = \tilde{W} \exp(-E_0 / W_m) \quad (4)$$

Evaporation from the soil surface at any time is equal to the sum of all water losses in all soil layers. For each of the latter, there is an equation:

$$W_i = \tilde{W}_i \exp(-k_i E_0 / (W_m)_i) \quad (5)$$

The problem of evaporation calculation is the assessment of evaporation. Here we can use the known correlation:

$$E_0 = (x' \cos \alpha) d \Delta t, \quad (6)$$

where  $d$  – the average deficit of humidity for the estimated time interval. The value of the coefficient  $x'$  is within  $(0,3-0,6)10^{-3}$  m/(mbars) depending on the type of surface.

In fact, the coefficient  $K$  is not a constant, it is different for different layers of soil and depends on the amount of moisture, especially in the subsurface layer. It is also seen that the stronger the layer, the more moisture in it and the higher the evaporation rate.

**Key words:** Infiltration, particle size distribution, soil moisture, porosity, filtration coefficient.

## **THE IMPACT OF SARS-COV-2 ON THE ROMANIAN PENITENTIARY MICRO-SOCIETY**

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The health of prisons also represents a component of the public health. The management of the epidemiological situations, regardless of the environment in which they occur, is, in itself, a major public health issue. The prison-specific human micro-societies are constantly subject to the phenomenon of transmitting various airborne diseases. This indoor environment is recognized as being one with high risk of transmission. The conditions that favor the spread are also optimal in this type of environment. The overcrowding, the prison mobility and the poor hygiene conditions make the prison a fertile area and ideal for viruses. The World

Health Organization (WHO) reports confirm that the risk of contamination in the prison environment is similar to that in the residential environment. In general, the infection rates in prisons followed those of the population. This virus affects everyone, both detainees and employees of this system. Even in these special conditions, the Romanian prisons did not become sources of infection out of control. The present study will highlight the impact of this virus on the prison environment. According to the latest official reports of the National Administration of Penitentiaries (NAP), the vaccination of the prison population is confirmed in the proportion of 77.4% (currently over 16% of individuals being released). Following this pandemic, the NAP leadership together with the responsible national institutions are launching new norms and procedures with immediate applicability, in general, aiming measures to prevent the spread of the airborne diseases.

## **STUDIES REGARDING THE SAFETY IN OPERATION OF THE PÎRCOVACI RESERVOIR, IAȘI COUNTY, ROMANIA**

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The dam of the reservoir Pîrcovaci, located on the Bahlui River is a homogeneous earth dam with a maximum height of 24.0 m., The foundation ground was sealed with a concrete screen on a length of 390 m and an average depth of 10.0 m. In order to control the infiltration regime, a drainage network was built, consisting of a collector drain along the downstream side of the dam and 5 transverse drains in the downstream prism, that discharge into the longitudinal drain. For tracking the evolution of seepage from the dam and the embankments, 28 piezometers and 4 infiltration discharge and measurement sections are used. Variations of the water level in the reservoir, the precipitation, and the temperatures are the external stresses that influenced the dam Pîrcovaci had as a first effect on the variation of the infiltration levels in the piezometers and the seepage flows. This paper presents a brief description of the dam and aspects regarding the behavior monitoring in time, during the years 1997-2021, and it focuses on the characteristic elements of the theoretical infiltration curve in the dam, the hydro isohypses for the dam drawn with SURFER program,

using the maximum hydrostatic levels in the piezometers measured in the year 2021.

**USE OF ECOCLIMATIC INDICES IN EXPRESSING THE  
VUNERABILITY OF FOREST ECOSYSTEMS TO CLIMATE  
CHANGE (CASE STUDY - EMERALD SITE “HÂNCEȘTI  
FOREST”)**

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Along with the national legislative requirements in the biodiversity protection field on the territory of the Republic of Moldova, the natural heritage protection is achieved through the Emerald Network presence, which includes special conservation areas, representing the extension in non-EU countries of the European ecological network – “Natura 2000”. “Hâncești Forest” Emerald site contains the vegetative associations of oak species and is situated in close distance to Hincesti town, Sarata Mereseni and Mereseni settlements (central part of country).

Climate change is associated with many and complex adverse effects on environmental components, including forest ecosystems. Climate ecometric indices are calculation formulas for climate favorability, taking into account the actual values of the main climatic factors. Among the eco-climatic indices are, also, the Forest Aridity Index (FAI) and the Forest Aridity Stress Index (FASI).

The calculation of the FAI included climatic parameters, temperature and average monthly precipitation, specific to the current year's growing season, with special emphasis on the so-called "critical months" (July-August) in the development of forest species from the temperate zone (Fuhrer E., et al 2011 ). High FAI values indicate that during the growing season and critical period for forest species, meteorological parameters show drier and drier development conditions and the lower FAI values - wetter and warmer climatic conditions.

It was found that FAI value varies throughout the study area, between 5.79 - 8.07 units, which is explained by the adjacent parameters with influences on climate (landforms, slopes, exposure, etc.). According to the FAI reference values, favorable for the growth and development of different species (Beech < 4.75; Oak with hornbeam 4.75 - 6.00; Sessile oak 6.00 - 7.25; Steppe forests > 7.25), the climatic conditions in the perimeter of the Emerald Site "Hâncești Forest", indicates territories for the growth and development of species characteristic for forest-steppe areas, and steppes.

The vital processes of the forest are influenced by evapo-perspiration and the relative humidity of the air, especially in the growing months (May-August), when the water regime induces a decisive impact on the forests vitality, which is in most cases - deficient. In this context, a regional index has been developed, which reflects the real impact of climate aridity on the functionality of forest ecosystems – FASI (Nedealcov M., 2020). The high values of FASI during the tree growth period indicate that arid / stressful conditions may occur for forest ecosystems, which induce the triggering of risks associated with climate change: vegetation fires, spread of pests, defoliation, discoloration, etc. FASI values, calculated for Emerald Site “Hâncești Forest”, vary between 1.07 - 2.33 units. These values characterize the normal or relatively arid climatic conditions for the forestry sector during the growing period (May - August), but taking into account the values obtained in a multiannual aspect, where it is observed that in the last decades (2000-2019) arid stress conditions appear everywhere (and several risks associated with climate aridity - droughts, fires, pest invasions, etc., also).

The study results are of particular interest in the sustainable management of the national forestry sector.

Keywords: climate change, eco-climate indices, Emerald site.

## **LAND USE AND ECOLOGICAL STABILITY COEFFICIENT ON THE TERRITORY OF THE REPUBLIC OF MOLDOVA**

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This study proposes a simple way to quantify ecological changes in a territory. The territory of the Republic of Moldova consists (from an administrative-territorial point of view) of 983 units (including 66 urban localities). Thus, the estimation of the ecological situation was carried out on administrative units of rank III for the year 2020. Five degrees of ecological stability (from 0 for an anthropic element to 1 for natural forests) and a coefficient of ecological stability ( $K_e$ ) related to land cover have been used to measure local ecological stability. Each administrative unit received a coefficient of ecological stability depending on how the land is used. By 2020, 51.5% of communes had a very unstable or unstable coefficient, and another 42.7% had an uncertain instability. Medium and high stability was recorded in only 5.8% of communes. The situation has not changed significantly in the last 15 years, so the identified trends can

be used to assess the effects of environmental measures proposed in land consolidation projects.

## **THE ASSESSMENT OF THE CALORIC STRESS CONDITIONS IN THE EASTERN ROMANIAN PLAIN**

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The thermal comfort is an expression of the satisfaction feeling in accordance with the weather conditions. A variable environment is a permanent source of stress for the human being. Maintaining the human body in a thermal balance is possible only if the thermoregulatory mechanism does not make significant efforts to create a state of physiological comfort. The present study proposes an assessment of the relative stress index regime specific to the Eastern Romanian Plain, for the period between 2011 and 2020. This type of assessment is useful in adopting strategies for the adaptation and mitigation to the bioclimatic conditions in the vulnerable regions, through personal adjustments to cope with the heat stress, realistic planning of living, recreation and health facilities etc. In general, the detailed assessment of the bioclimatic indices is interesting and useful in studying their spatial and temporal variation. It is also useful to apply a single reference scale in order to expose properly the people to the weather. Along with the presentation of the weather, it is necessary to describe the conditions of the comfort or the physiological risk related to the climate.

## **THE IMPACT OF THE LATE FROSTS ON PERENNIAL CROPS IN THE CLIMATE CHANGE CONTEXT**

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Taking into account Republic of Moldova's agrarian orientation, where the pomiculture is one of the main branches of agriculture, 54.4% of which in its turn is represented by the apple plantations, we consider it appropriate to pay special attention to the study of meteorological conditions that form the productivity of this crop. The results obtained will contribute to the

optimization of agricultural technologies by minimizing their harmful influence, as well as minimizing the additional costs incurred by farmers. Information on the frequency, duration and intensity of dangerous frosts will also serve as an argumentative support for breeders in obtaining varieties resistant to this risk. On the other hand, an advantage of these results, in addition to the aforementioned contribution on the development and modernization of forecasting and prevention methods will allow the strengthening of means of protection, the location of perennial crops, which aim to combat and / or mitigate the negative consequences of these unfavorable weather conditions, including frosts during the transition seasons. Achieving a higher harvest value and quality agricultural products is closely dependent on several factors, including frost resistance, especially those that appear in late spring. These frosts have a detrimental effect on buds, flower buds, flowers and productivity rudiments. Along with the changes taking place at the regional climate level, there are also changes in the manifestation of frost, which determines the need to update the information and its processing, using modern GIS methods.

**RESEARCH ON TURNING A DRY DAM INTO AN  
IMPOUNDING DAM. CASE STUDY - THE NON-PERMANENT  
ACCUMULATION CÎMPENI, BOTOȘANI COUNTY, ROMANIA**

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TOPOLNICEANU<sup>1</sup>, Anca ZABORILĂ<sup>1</sup>, Adelina CUCUTEANU<sup>1</sup>,  
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The purpose of this study is to assess the current technical condition of the non-permanent Cîmpeni accumulation, situated on the Miletin River, in Botoșani county, and the possibility of turning the dry dam into an impounding dam. The changing of the non-permanent accumulation, into a permanent reservoir may be required in the future for the use of the volumes of water accumulated for irrigation and fish farming. It is also imperative to maintain its current function of flood mitigation for the downstream areas. In order to change the operating regime of the non-permanent accumulation Cîmpeni, into a permanent retention regime, it is mandatory for the owner to promote a Technical Project that includes a series of construction works. These works consist of: the consolidation of the upstream slope of the dam, the creation of a draining prism at the base of the downstream slope, along its entire length to lower the infiltration

curve, and the construction of a maneuvering tower equipped with a metal gate to control the discharged flows through the bottom outlet. By implementing this project and by increasing the degree of behavior monitoring of the hydro-technical works, it is possible to increase the safety of the dam in case of high waters and the efficient use of the volumes of water from the reservoir.

**URBAN CLIMATE ASSESSMENT: A PRE-REQUISITE IN  
DESIGNING CITIES' RESILIENCE RESPONSE TO CLIMATE  
CHANGE FOR ROMANIA'S NORTH-EAST DEVELOPMENT  
REGION**

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Current climate change overlaps with a clear tendency of the human population to concentrate in cities. These combined trends increase both the exposure to weather extremes and the vulnerability of the population, forcing the authorities to adapt environmental policies aimed at increasing the resilience response of urban areas to climate change. However, in order to develop such policies, an adequate assessment of the climatic conditions inside cities is needed. The proposed presentation indicates the main objectives of a research project developed in this idea. In situ observations, expeditionary measurements and climate information derived from satellite images are foreseen to be implemented and explored for the 16 most important cities located in the North - Eastern Development region of Romania aiming to accurately depict urban climate conditions. Based on all available meteorological data, we also aim to describe the synoptic types that are commonly associated with extreme weather conditions in selected cities. Future climate conditions will also be estimated based on climate scenarios. These analyzes are intended to increase the prediction of extreme weather and climate conditions, representing key elements for a sound scientific basis on which resilience policies should be based.

## **POROUS MULTIFUNCTIONAL HYDROGELS BASED ON CHITOSAN AND THIOUREA FOR ADSORPTION OF HEAVY METAL IONS FROM WASTEWATERS**

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Environmental pollution occurs on a global scale as a result of various anthropogenic and natural events in recent decades. Particular interest has been given to metal ion pollution, seeing that they are persistent over time and very toxic, but at the same time non-biodegradable. Many functional materials are currently being developed for use in various areas. Macroporous hydrogels are prominent examples of such systems, their particular features including porosity, high elasticity, controlled swelling, fast stimuli responsiveness etc., being appropriate for pollutant removal, drug delivery, sensing or soft robotics [1-4]. In this work, the preparation of porous chitosan-based hydrogels stabilized by formaldehyde cross-linking under freezing conditions (-20 °C), in the absence or in the presence of thiourea as flexible spacer, is investigated. Optimization of synthetic conditions has been performed as a function of chitosan concentration, thiourea content in reaction mixture and molar ratio between amino groups and formaldehyde. The obtained hydrogels were characterized by scanning electron microscopy and FT-IR spectroscopy. The obtained hydrogels were tested as sorbents for the removal of Cu(II) and Pb(II) ions from simulated wastewater. The influence of pH, contact time and equilibrium concentration on the sorption process was studied. Experimental data was fitted with suitable kinetic and isotherm mathematical models.

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**COPPER IONS EFFICIENT REMOVAL FROM WASTEWATERS  
BY USING ETS-10 AND SBA-15 AS  
ADSORBENTS/INDEPARTAREA EFICIENTA A IONILOR DE  
CUPRU DIN APELE REZIDUALE UTILIZAND ETS-10 SI SBA-15  
CA ADSORBENTI**

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The problem of waters pollution with heavy metal has become one of the serious problems. The release of heavy metals into the water has increased noticeably as a result of industrialization, and thereby lowered the quality of the environment to an alarming level. heavy metals can accumulate to toxic levels through the human food chain and the biosphere from the environment, which can disturb the biochemical processes and human health [1-3]. Due to the mobility and toxicity, the presence of copper ions in water represents a real inorganic contamination problem. Therefore, it is important to remove copper from effluents, before discharging them into water bodies. The objectives of the present study were: (i) to investigate and establish the optimum conditions of pH, sorbent dose, copper concentration and temperature for the sorption capacity and removal efficiency in non-competitive conditions; (ii) to model the kinetic and equilibrium of copper adsorption in order to evaluate the kinetic and isotherm parameters; (iii) to establish the level of reusability of the sorbents during consecutive sorption/desorption cycles.

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## COMPARATIVE PHYTOTOXIC EFFECTS OF SINGLE AND BINARY MIXTURES OF HEAVY METALS EXPOSURE ON LAVENDER (*LAVANDULA ANGUSTIFOLIA* L. “HIDCOTE BLUE”)

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Heavy metals are specific components of the environment divided in essential and non-essential types. Soils polluted with heavy metals have become common due to an increase in geologic and anthropogenic activities. Heavy metals phytotoxicity, such as cadmium, nickel, lead, etc. represents a major concern in agricultural production due to the negative effects on food and product safety [1].

Lavender is one of the most cultivated species for ornamental, medicinal and cosmetic purposes. It is widely used in French cuisine for its aroma and in alternative medicine for antioxidant, antimicrobial, antibacterial, anticonvulsant, antidepressive, sedative and calming properties [2]. The aim of the present study was to investigate and to compare the effects posed by Pb(II), Cd(II) and Ni(II) presence in single and binary mixture treatments applied to *Lavandula angustifolia* L. cultivar “Hidcote Blue” (lavender). The results are the basis of further investigations of heavy metals stress on lavender in soil.

Pb(II), Cd(II) and Ni(II) were applied as treatments in single and binary systems to selected *Lavandula angustifolia* L. seeds in Petri plates sealed with parafilm, in order to assess their phytotoxic effects by the investigation of the following parameters: radicle, hypocotyl and leaves length, germination, tolerance, toxicity and vigour indexes (%). The methodology was used in line with the OECD guidelines for testing of chemicals [3]. The heavy metal contamination in the single system consisted in 8 treatments with Pb(II), Cd(II) and Ni(II) (2.5 - 100 mg/L) and 4 treatments in the binary mixture (including control sample in both systems). The number of germinated seeds was counted every day over a period of 21 days. All the experiments were carried out in triplicate and the data were expressed as  $\pm$  standard error of the mean.

The present study shows novel evidence on the phytotoxic effects of Pb(II), Cd(II) and Ni(II) to the early development of *Lavandula angustifolia* L. seedlings. The assessment of lavender seeds phytotoxic effect caused by heavy metals has shown that the germination degree is mostly affected by

the presence of Ni(II) at a concentration of 100 mg/L. As the concentration of Pb(II), Cd(II) and Ni(II) increased, the germination rate of the tested seeds decreased up to 83.33%, 53.33% and 33.33%, respectively. In the presence of heavy metals binary mixture the germination degree is more affected by the Pb(II) and Ni(II) combination, decreasing from 100% to 77%.

Our findings indicate that lavender growth is highly inhibited especially in the presence of Ni(II) in the single metal system, while in the presence of mixture, the growth is inhibited by the presence of Ni(II) and Cd(II) and also Ni(II) and Pb(II) combination, indicating a deficit development of radicle, which is the most affected component, followed by hypocotyl and leaves.

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## **FUTURE CLIMATE PROJECTIONS IN THE REPUBLIC OF MOLDOVA**

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The article presents future climate projections in the Republic of Moldova, developed based on RCP scenarios (representative concentrations pathways) that provide us with a probable variant of the climate that will result from the emission level chosen as a working hypothesis. In our case we used the RCP4.5 scenario which corresponds to a forcing level of +4.5 W/m<sup>2</sup> and we consider it the most likely scenario to manifest and the easiest to monitor. As a result we had obtained the final maps of climatic projections presented as the sum of the climate of the reference period and its changes according to the scenario chosen for the period 2021-2040.

## **SUSCEPTIBILITY ASSESSMENT OF FRESHWATER ENVIRONMENTS TO PLASTIC POLLUTION (SAFE-PP). START OF THE RESEARCH PROJECT FOR YOUNG INDEPENDENT TEAMS**

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Freshwater pollution with plastic waste is a serious environmental problem in countries with deficient waste management such as Romania. The project innovation is to develop a new model framework (SAFE-PP) in the regional assessment of freshwater plastic pollution susceptibility. Such a method is necessary because there are significant disparities in terms of river catchment features, waste management performances and socio-economic indicators within a region or county. The project aims to validate this model of susceptibility through case studies in the mountain area (eg Izvoru Muntelui and Bistrita Valley) and transitional areas (mountain-subcarpathian-valley corridor) supported by a hydrological analysis; to identify "hot spots" of pollution with plastic waste and the causes of their production; to analyze the role of floods and tourism in waste pollution and to propose a support tool for decision-makers in the study area using a GIS platform. This research project will point out the best practices related to plastic wastes to stimulate the circular economy in Romania and to improve waste management practices in both urban and rural communities in the proximity of freshwater bodies. The project will be useful to local communities in combating and preventing illegal dumping through prior identification of areas susceptible to such bad practices as well as in prioritizing investments related to plastic waste management.

## **THE CORRELATION OF THE THERMAL COMFORT WITH THE INDOOR WORKSPACE MICROCLIMATE PARAMETERS**

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The study is intended to be a qualitative and quantitative synthetic expression of a necessary analysis in a decision-making process. A proper

management of an indoor workspace (such as the medical offices with specific medical equipment) involves evaluating the possibilities for implementing and assessing the degree of satisfaction of the thermal comfort, as well as managing how the microclimatic parameters influence an environment. This aspect must be regulated because it is known that, at some point, the state of the thermal comfort is characterized by subjectivity. Both the correlation between the thermal comfort factors and the microclimate parameters of the indoor workplace and the comfort level scale highlight the conscious state that expresses the satisfaction or dissatisfaction with the thermal environment in those places, for both employees and patients. The reduction of the stress factors that influence the thermoregulation process of the human body and implicitly a reduction of the manifestation state of the insecurity syndrome are helped by an appropriate methodology in assessing the degree of satisfaction of the thermal comfort. These issues involve a process of validating the decision and finding alternative solutions.

## **LANDSCAPE AND GEOCHEMICAL FEATURES OF THE TERRITORY OF THE CITY OF VYZHNYTSIA, CHERNIVTSI OBLAST**

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A significant differentiation of landscape areas and tracts of the territory determines the diversity of its natural geochemical landscapes, which is enhanced by the anthropogenic and man-made load. The latter enhances the geochemical differentiation of geochemical parameters, mainly in places of man-made contact. The territory of Vyzhnytsia, which is located at the junction of two physical-geographical regions of the Carpathian physical-geographical country, has such characteristics. There is a direct collision of various landscapes. The city landscape combines the properties of the natural landscape and the functional features of urban man-made systems and is a hierarchical system consisting of interacting natural and technical subsystems that develop according to natural and social laws. Vyzhnytsia is located in the foothills of the Chernivtsi oblast, in the area of meadow-forest and mountain-forest types of landscapes. The valley landscapes of the Cheremosh and Vyzhenka rivers are widespread as well. According to geochemical zoning, the territory of the city of Vyzhnytsia belongs to the Cheremosh-Banyliv landscape-geochemical settlement district, which is, in general, a valley-terrace meadow-forest area with grey

and dark grey podzolic and sod-gley soils on loams and sand-loam deposits. Geochemically, the territory of Vyzhnytsia belongs to the family of transitional from forest to steppe geochemical landscapes of the acid-calcium class. It is characterized by slow and medium water exchange and the predominance of eluvial elemental landscapes. The groundwater of the city by their alkaline-acid conditions are neutral and slightly alkaline, by hardness, hard and very hard, by mineralization fresh and weakly mineralized, by type sodium bicarbonate, but the content of certain compounds and elements does not exceed the TLV. General geochemical features of waters indicate the presence of geochemical processes that are typical for meadow-forest landscapes. Keywords: landscape, geochemical zoning, settlement landscape, natural landscape.

### **INTRODUCING THE EARTHQUAKE SYSTEMIC VULNERABILITY INDEX (ESVI). CASE STUDY: THE URBAN CENTRES IN THE SOUTH-EAST REGION OF ROMANIA**

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Earthquakes represent destructive phenomena with major impacts around the world, particularly in urban areas, where the density of both population and buildings is high. In this context, failures related to proper allocation of resources, to the identification of optimal routes between the affected urban areas and relief centres, and to the mitigation of potential earthquake-triggered destructive phenomena emerge as systemic vulnerability sources. This paper aims to assess the seismic systemic vulnerability of the 6 administrative centres in the South-East region of Romania, by proposing a weighted composite index (Earthquake Vulnerability Index, ESVI). The study area was selected due to its high propensity to seismic hazards, determined by the proximity to one of Europe's most active seismogenic areas, the Vrancea Seismogenic Zone. ESVI integrates indicators referring to the accessibility of emergency services centres, the capacity of the local medical infrastructure and secondary danger sources. Its validation relies on Sensitivity Analysis, Multi-Criteria Decision-Making (MCDM) methods, and Aggregate methods. According to ESVI, the hierarchy of the major urban settlements in the South-East region of Romania in terms of systemic vulnerability (1. Brăila City, 2. Buzău City, 3. Constanța City, 4. Galați City, 5. Focșani City, 6. Tulcea City) is independent of the

demographic size and the economic profile of the alternatives. Such findings and the maps integrated in ESVI are useful to identify the most vulnerable urban centres and the hotspots of vulnerability within them, allowing for advanced regional and local scale planning of emergency interventions.

## **LOCAL 3D GEOLOGIC, GEOTECHNICAL AND GEOPHYSICAL MODEL - A NECESSARY STEP FORWARD FOR ASSESSING THE LOCAL SEISMIC HAZARD OF A DENSELY POPULATED AREA**

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In the past decades, the necessity for detailed earthquake microzonation studies was recognized for Bucharest city first, because here were recorded the major damage at last major reathquales, as well as for other densely populated cities in Romania exposed to a major seismic risk due to the intermediate depth earthquakes occurring in Vrancea zone. Therefore, different approaches were established which incorporate non-linearity analyses, which generally did not take groundwater level changes into account. For this purpose, notably numerical models are most suitable. These models require a good knowledge of the local geological conditions (especially of the uppermost unconsolidated units), information about the geotechnical parameters of these units, and a hydrogeological model of the investigated area. These models required first the construction of a robust database which should contain all the information about geological strata in the area down to at least 100 m depth or more. The database should contain not only information about geology or geometric data of the layers, but also other geophysical and geotechnical related information like the characteristic density and average seismic velocity for each layer, as well as the water table variation in the area. All of them have proved to be important in a scientific assessment of the local seismic hazard according to the modern procedures able to have an output in the domain of the local seismic hazard (microzonation) of the city. Most of this information can be obtained from geotechnical investigations and surveys that have already been carried out in most densely populated areas. In the last 25 years a lot of valuable information are gathered by different research institutes and

only part of them were published. Other part of the dataset will be acquired beginning now, according to new methods specially designed in order to not disturb the daily activity in the city and to respect the green spaces and the general environment in the city. The present study is an effort to establish a numeric database, organized from all these information in a GIS environment, capable of giving an appropriate image of the Bucharest surface and shallow geologic layers until 100-150 m depth. Due to the rapid changing of these physical properties in surface and in depth, it is required that we have verified values in a grid of 100 x 100 m and with an error of +/- 1 m in depth. The geologic layers database, together with database of the static and dynamic properties of the sedimentary rocks, that is already accomplished, will serve as valuable input for further studies aiming to a thorough quantification of local seismic hazard in Bucharest city.

## **GIS-BASED MULTI-CRITERIA ANALYSIS FOR FLOOD PRONE AREAS AND SUITABILITY ESTIMATION FOR URBAN PLANNING IN NORTH-EAST REGION OF ROMANIA**

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Natural hazards are phenomena that are capable of causing major damage to both natural and anthropic environment, but their impact differs according to the phenomenon's location, intensity and frequency. In order to minimize the loss of human lives and to reduce the economic impact, it is necessary to implement an adequate territorial planning in relation to the spatial distribution of natural disasters. Most settlements from the North-East Region of Romania are located / developed in areas with a high degree of risk, and the events of the past two decades have highlighted the vulnerability of human communities by increasing the material damage and through the reduced absorption capacity of the phenomenon. In the present study, the Analytical Hierarchy Process (AHP) supported by a Geographical Information System (GIS) is used to produce assessment map on flood hazard. The factors integrated in the hazard analysis are: slope, elevation, profile curvature, lithological units, land use, distance from stream, soil texture. These factors are normalized and weighted by giving bonitation indices and included in the matrix of pair comparison, to determine the weights in the analysis and making the flood map from the

study area. The proposed methodology shows that the surfaces of hazard groups high and very high occupy a weight of 26.81%, respectively 4.97% and are distributed in the areas near the watercourses. This map is used to analyse the directions of territorial development in the last 30 years and to identify the expansion trends in relation to the hazard to which the area is exposed.

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## **DURATION AND MAGNITUDE OF DROUGHTS IN REPUBLIC OF MOLDOVA**

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The purpose of the research was conditioned by the increase in the frequency and intensity of droughts during the years 1981-2020. The Republic of Moldova, located in the South-Eastern part of Europe, is often affected by this unfavourable climatic phenomenon, which is largely generated by climate change and less by the natural variability of the climate. 2020 was a very dry year. According to the General Inspectorate for Emergency Situations, the losses in agriculture due to the drought amounted to about 7.2 billion lei. The SPI Standardized Precipitation Index and the SPEI Standardized Precipitation and Evapotranspiration Index, developed by McKee and S.M. Vicente-Serrano and recommended by the World Meteorological Organization for drought assessment, were chosen from the multitude of climate indices used to assess droughts. SPI and SPEI were calculated from the data of 17 meteorological stations at the (accumulated) time scales of 3, 6 and 12 months. The negative values reflect the periods of time with moisture deficit, and the positive ones - with excess moisture in the soil. The SPI and SPEI charts from the north (Balti), the center (Chisinau) and the south (Cahul) of the country are presented as an example. Increasing the accumulation period from 3 to 12 months increases the duration, but decreases the frequency (number of droughts) and monthly intensities. It also decreases the magnitude, defined as the sum of the monthly intensities. The magnitude is expressed by the area on the charts for the dry period. The decrease in the frequency of droughts is explained by the consolidation of small periods with excess moisture. From the structural viewpoint, a drought has a beginning, then a development

with an increasing intensity, but also with some decreases on the small time scales, and the end. There are several types of drought classifications: meteorological drought, when dry weather dominates an area; agricultural drought, when crops are affected by drought; hydrological drought, when low water supply is evident in the water supply system; socio-economic drought; ecological drought. The U.S. Drought Monitor rates drought intensity from abnormal dry (D0) to exceptional drought (D4). McKee classifies droughts as mild ( $0 < \text{SPI} < -0.99$ ), moderate ( $1.00 < \text{SPI} < -1.49$ ), severe ( $-1.50 < \text{SPI} < -1.99$ ) and extreme  $\text{SPI} < -2.00$ . In the paper the classification was made after McKee. It is obvious that at different stages of development the extreme drought changes from meteorological drought to agricultural and sometimes hydrological one, each of them covering certain parts of the total duration of the drought. Short-term weather forecasts of 7-10 days cannot effectively predict droughts. Drought development monitoring and analysis can be used in forecasting drought intensity next month, for example, through the ARIMA procedure. The spatial distribution maps of the magnitude of the drought in 2020 are presented as an example

Keywords: standardized climate indices SPI, SPEI, drought duration and magnitude

## **CAUSES OF SPATIO-TEMPORAL VARIATIONS IN THE FLOOD EVENT EFFICIENCY INDEX**

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Spatio-temporal variation of suspended sediment load is a topic of real interest in river geomorphology, especially in the current context of climate change and increasing anthropogenic impacts. In the present study, an attempt was made to argue for these variations based on the correlations between the event efficiency index and the degree of sediment availability in river channel following flood events. Data from four gauging stations along the Trotuș River (Romania) were used to show these types of relationships. The results show that the spatial variations of the event efficiency index are in close correlation with the characteristics of the riverbed in the sectors analysed, and the temporal variations reflect the role of flood events in the modification of river channel and the availability of sediment. Major flood events have caused visible changes in the suspended sediment flux, which is why the analysis of the spatial and temporal

variations must necessarily take into account the characteristics of the river channel in terms of sediment sources.

Key words: flood event, suspended sediment load, event efficiency index, sediment availability, Trotuș River

## **DERIVING A UNIT HYDROGRAPH FOR TAZLĂU RIVER BASIN USING ARCGIS**

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Hydrographs are used in hydrological studies to illustrate the fluctuation of the stream during rainfall. A hydrograph's total flow includes runoff and base flow. The unit hydrograph only measures direct surface runoff. Modeling rain events by using unit hydrograph theory has the advantage of being easier to determine than hydraulic distributed modeling and can yield desirable outcomes for objectives of applied hydrology. The purpose of this research is to generate a unit hydrograph for a section of the Tazlău River Basin by utilizing the physical properties of its basin. For this purpose, parameters such as peak discharge, time to peak discharge and the base width of the unit hydrograph were determined. This research explored the use of GIS and Digital Elevation Model in the development of unit hydrograph for streamflow predictions and rainfall runoff modeling. The most common uses after creating a unit hydrograph are designing flood prediction, which estimates flood flows in real time based on rainfall records, runoff assessment from ungauged watersheds and supplement the incomplete archives.

## **CITIZEN PARTICIPATION BETWEEN HERITAGE PROCESS AND EVENT CONTEXT, CASE OF THE EVENT OF CONSTANTINE CAPITAL OF ARAB CULTURE**

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Several studies seem to introduce citizen participation as a decisive factor in the process of a project's success (Pinto & Slevin, 1989). This prerequisite for the effective progress of the project takes on more importance when the operation requires participatory management, often

incremental, bringing together a multitude of actors. Due to the complexity of its process, citizen participation in conservation operations is a very difficult enterprise to perform. This difficulty is increased by the imposition of shorter time-limits during the full context of events, which makes it one of the most difficult challenges. Through this research we direct our reflection towards the Algerian context, more precisely the rehabilitation projects of Constantine capital of Arab culture event, by examining citizen participation, in particular on its link with the success of the rehabilitation project in a turbulent context (events). The mixed method combining qualitative and quantitative investigation is followed to answer the questions of this research relying on the interviews with the actors concerned and on the questionnaires with the inhabitants.

## **INTEGRATING NATURE IN ROMANIAN CITIES THROUGH URBAN PROTECTED AREAS**

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In their search for sustainability and resilience, cities have increasingly returned to nature, and integrating forms and concepts associated with nature in the urban planning process is an increasingly frequent process, especially at European level. Urban protected areas are such a form of integration, bearing different names and covering various levels of conservation across different geographical and planning systems. The common connection is that they can provide simultaneous benefits to biodiversity (habitats for wild species), residents (improved human welfare and happiness through interaction with nature), economies (increased land value, fostering various economic activities) and public administration (decreased expenses for public space management, alternatives for urban regeneration).

In our paper we present a framework for using urban protected areas in Romanian cities, based on the multiple levels of: (a) rationale of designation and the conservation status of protected elements; (b) integration in the national legislation and in the general framework of urban planning and management systems; (c) connection with local and regional economies; (d) features of human use and preferences for specific forms of urban nature; (e) efficiency of urbanization control and (f) ecological networking with other categories of natural protected areas. Such efforts for the design and management of urban protected areas are important in the context of the national legislative proposal for urban protected areas

and urban biodiversity, especially as numerous local initiatives exist in Romania from NGOs and civil society.

## **THE DEVELOPMENT AND RELATION BETWEEN SUSTAINABLE GEOTOURISM AND DARK TOURISM IN IASI AREA RELATED TO BUILDING MATERIALS**

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The area of Iasi city is located in the north-eastern region of Romania, inside the Moldavian Plateau, between Moldova and Prut river valleys. Iasi is the most representative city in the entire region, from a historical, cultural and also religious point of view. The areas surrounding Iasi city were the subject of the first geological scientific paper written in Romanian language by Grigore Cobalcescu 1862. The geological aspects of the current extent of the entire county have been the very first landscape features that were systematically addressed by early studies in the region. The geotouristic activities reside in the mixture of several factors that have evolved significantly in time and space, and are subject to dynamic processes, differently perceived by people, depending on the role each of them plays. The aim of the current study is to identify the relation between geotourism and dark tourism, the geological and geomorphological features of the region, and the iconic, historical buildings in Iasi city, which are proposed as architectural dependencies. This inventory is related to an itinerary recommended as a geotouristic mean of promoting the cultural and historical values with their dark stories. The selection of emblematic buildings and historic monuments has been undergone by identifying them in written references regarding geomorphologic, geologic, cultural, historical, turistic or even literary manuscripts. Geotourism and Dark tourism are the youngest subsets of tourism and their application in the cities of Romania is rather scarce.

This study represents a new way to approach the sustainable tourism in Iasi area, especially involving the link between geomorphological and geological features of the region and their bias in historical buildings of Iasi city. This paper will take into account the sustainable development of tourism in this city.

Binding the geomorphological and geological heritage with the cultural and educational dimensions of a visit in Iași area, numerous benefits regarding the geotourism development can be offered. The first idea to support such way of tourism was establishment of geoparks in the areas containing geological and geomorphological sites, recognizing the patrimonial value of a territory.

Keywords: Geoheritage, Sustainable Geotourism, Cemeterial Geotourism, Dark tourism.

**EVALUATION OF THE INVASIVE POTENTIAL AND FACTORS THAT CONTRIBUTE TO THE SPREAD OF THE SPECIES *IMPATIENS BALSAMINA L.* AND *REYNOUTRIA JAPONICA HOUTT.* IN THE BASIN OF THE BISTRIȚA RIVER, ROMANIA**

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In this material, we want to assess the impact that anthropization has as a significant factor in the spread of *Impatiens balsamina L.* and *Reynoutria japonica Houtt* species.

In our research, we took into account the already mapped and known populations of these two non-native species that have accentuated invasive-aggressive tendencies where anthropogenic, edaphic, ecological, and climatic factors allow them.

At the same time, in our research, we have shown that the trend of aggressive-invasive spread is emphasized by the major climate changes that are taking place in the last decade.

The spread of these two species has become problematic in the last decade because, due to environmental factors, it has become unrestrained and is about to become uncontrollable in certain areas and for some points of interest in the studied river basin. Both species spread rapidly on disturbed and marginal lands.

Their aggressive spread leads to the elimination of valuable meadow habitats, the reduction of biodiversity, and the appearance of chemical changes in the soil.

Based on the current population spread, we used Inverse Distance Weighting (IDW) interpolation which estimates unknown values by specifying search distance, closest points, power setting, and barriers. This results in a map of the species' potential distribution within the basin.

Keywords: distribution, meadow, invasive species, IDW, environmental factors

## **“ALL FOR FORESTS”. CIVIC CAMPAIGNS AND LOBBY STRATEGIES FOR MODIFYING THE FORESTRY CODE**

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Law no. 46/2008 The Forestry Code has suffered two cycles of substantial modifications, in 2015 and 2020, respectively. Between 2015 and 2022, the system of tracking timber called SUMAL 2.0 (initially the Forest Radar, then SUMAL) has been debated and developed.

The main changes in the Forestry Code have targeted the 2015 introduction and 2020 keeping, respectively, of the anti-monopoly article, the procedures regarding the environmental evaluation, the change in the definition of timber material, acces in the forest, cuttings in national parks, the tightening of sanctions concerning illegal cuttings and illegal transportation of timber, all while SUMAL 2.0 was meant to ensure timber traceability and of the implementation of EU Timber Regulation 995/2010. The public debates and consultations regarding this legislation (at parliamentary and governmental level) have generated strong in society emotion, that have given rise to country wide civic protests (in May 2015 and November 2019, respectively), but also in the Diaspora Romanian communities.

On the one hand, these debates have been influenced by journalistic investigations into illegal forest cuttings (especially inside talk shows like “Romania, te iubesc!”, ProTV and “In premiera”, Antena 3, or as part of independent journalistic projects RISE Project and Recorder, or in the international press), by investigations and reports from environmental NGOs (Environmental Investigation Agency - EIA, WWF România, Greenpeace România, Agent Green, Declic, Asociation for Higher Values) or simply by unaffiliated environmental activists (Tiberiu Boșutar, Daniel Bodnar).

On the other hand, the interests of the timber exploitation and processing industry and of the owners and private administrators of forests have been promoted through an intense lobby activity (especially made by the

Association of Timber Industry Prolema, Fordaq forestry community and by “Nostra Silva” Federation of Romanian Owners of Forests and Pastures, altogether having management and financing). The electoral context of years 2015, 2016, 2019 and 2020 has been influenced in its turn by the debates and decisions taken.

This research is case study, using the qualitative method, which follows the way public opinion has been influenced (implicitly also the political decisions regarding the modifications to the Sylviculture Code and implementation of SUMAL 2.0) by the communications and mobilization strategies of NGOs and environmental activists, by the strategy and mechanisms of the timber industry lobby activities and by the reflection of these debates in the media and on social networks. The presentation is part of the author's ongoing PhD research with the subject matter “Environmental journalism and environmental communication in the digitalized era”.

## **SOIL FERTILITY PROPERTIES IN THE ICDP PITESTI - MARACINENI FRUIT TREE PLANTATION AS RELATED TO FRUIT TREE GROWING TECHNOLOGIES**

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Soil undergoes most influence from the other environment components and has in its turn the greatest and most complex influence upon them. It evolves in time, under natural or anthropic influences, more than the other environment components and the changes it undergoes persist longer and influence more life quality, especially through its role of growth and nutritive environment for people and animals vegetal food. The soil of the ICDP Pitesti - Maracineni fruit tree plantation is but one of the examples that can illustrate the previous statement. In an experimental lot cultivated with plum tree, a former Eutric Cambisol was modified through land use change works and it is now represented by an Aric Regosol (according to WRB-SR 2014). Beyond such dramatic changes induced by works necessary for preparing the land for fruit tree plantations which are not recurrent or are retaken at large time intervals, researches carried out over several tens of years highlighted important variations of soil fertility properties linked to different experiments with fertilizers and growing technologies and/or of different varieties and genera comparisons. This paper presents several such variations of the soil fertility properties in the

ICDP Pitesti - Maracineni fruit tree plantation following several experiments that involved different varieties and genera and different fertilization schema. The observed differences between differently cultivated and fertilized lots remained in the optimum contents domains of nutritive elements for fruit tree growing.

**DIVERSITY OF SAPROXYLIC DARKLING BEETLES  
(TENEBRIONIDAE: COLEOPTERIA) IN THE REPUBLIC OF  
MOLDOVA**

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The *Tenebrionidae* family is characterized by body color, nocturnal lifestyle and preference to arid, xerophilous and sandy places. More than 20.000 species of this group are described in the world's fauna, and almost 1.800 of them are described from Europe. However, saproxylic species of *Tenebrionidae* family are under-studied. *Saproxylic tenebrionides* are very sensitive to environmental changes resulting from their life in unique microhabitats invaded by fungi from dead wood and depend on the quality and quantity of decomposed wood in the forests. In intensively managed forests with the total extraction of wood in various stages of decomposition, the diversity of saproxylic beetles decreases dramatically. At present, a major concern at European and global level has become the need to maintain and restore biodiversity in forest ecosystems. Scientific research carried out in last century in Europe has shown that species of saproxylic beetles are on the verge of extinction or have become rare, which has forced the scientific community to adopt local and international conventions for the protection of insects' biodiversity. To warn of the dangers of losing the biodiversity of saproxylic species of the *Tenebrionidae* family, they have been analyzed according to rarity criteria in several European countries, including Slovakia, Germany, United Kingdom, Norway, Sweden, Finland, Denmark and Austria. In the Republic of Moldova, a total number of 52 species from 37 genera and 5 subfamilies of the family *Tenebrionidae*, from different trophic groups: saprophagous, mycetophagous or less often predatory was recorded. The materials examined in this paper include only species of saproxylic insects accumulated during research carried out between 2005 - 2022 years, in 46 localities of the country, previous published entomological papers and three analyzed entomological collections of the Museum of Entomology of the Institute of Zoology, the

National Museum of Ethnography and Natural History, the Institute of Genetics, Physiology and Plant Protection from the Republic of Moldova. As a result of investigation, a list of saproxylic Tenebrionidae beetles which includes 21 species from subfamilies: *Alleculinae*, *Diaperinae* and *Tenebrioninae* was elaborated. Between revealed species *Platydemus dezaeni* Laporte de Castelnau & Brull, 1831 is new for the Republic of Moldova and *Neatus picipes* (Herbst, 1797) was collected a second time in the country even if entomological research being carried out since XIX century. Based on the collected materials, the data from the entomological collections and the citations, degree of rarity of revealed saproxylic beetles from the Republic of Moldova was proposed.

## **THE LEGAL REGULATION OF INTERNATIONAL LIABILITY IN ENVIRONMENTAL PROTECTION**

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One of the principles of international law consecrates the rule that performing an illegal action under the jurisdiction of a state triggers its international liability - a principle that is naturally also applicable in international environmental law. Unfortunately, international law remains rather reluctant to accept and especially to implement the idea of international liability of the states for prejudices brought to the environment.

Generally, liability as an essential component of any form of social organisation is the post-factum reaction of society towards the non-compliant behaviour in relation to the provisions of the legal norms, which does not meet the rule of law, disturbing social balance or, in our case, ecological balance. It is thus necessary to impose the obligation for the states to draw a national legislation that includes pollution liability, in accordance with the international provisions and agreements, based on the principle that the polluter pays, combined with the need for collaboration and exchange of information on environmental issues between the states. Although international environmental law does not include enough efficient norms to trigger liability for cross-border damages inflicted on the natural environment on the territory of other states, in order to solve the problem, it is possible to resort to adapting and applying legal institutions that belong to other branches of international public law (river law, maritime law, spatial law, etc.), which has subsequently lead to shaping

new categories or forms of liability in the field of environmental protection and the preservation of natural resources.

Key words: legal liability, environmental protection, ecological disasters, international law.

## **SUSTAINABILITY ANALYSIS OF Cd(II) BIOSORPTION FROM WASTEWATER USING MICROBIAL BIOMASS**

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Water pollution is a serious environmental issue that affects the natural world and thus, also human health. Among the most impactful pollutants are heavy metals which are difficult to remove by conventional sorbents and bioaccumulate over time in the living organisms causing increased damage. Studies have shown that microorganisms are very effective in the removal of metal ions from wastewaters. However, up to date, the microbial-based metal uptake technology has not been upscaled. In order to successfully scale up at industrial level, environmental impact studies must be carried out in order to ensure the sustainability of the biosorption process. The purpose of the present study is the quantification of the environmental impact of Cd(II) removal from wastewaters by applying *Arthrobacter viscosus* bacteria and *Saccharomyces cerevisiae* yeast biomass through Life cycle assessment (LCA). The LCA methodology was applied according to the ISO 14040 and ISO 14044, that are international standards with the fulfillment of all mandatory stages: goal and scope definition, inventory analysis, impact assessment and interpretation. The data obtained was analyzed using Gabi software and by applying the ReCiPe 2016 method. The established functional unit was the treatment of 1 L of wastewater polluted with Cd(II) at a concentration of 25 mg/L. The results showed a higher total environmental impact in case of Cd(II) uptake using *Arthrobacter viscosus* (88.3 pers. equiv.) in comparison to the value obtained in case of *Saccharomyces cerevisiae* (72 pers. equiv.). Furthermore, higher impact values were determined for the biosorbent obtained from the bacterium specie for each impact category. Thus, for

both applied microorganisms the impact category with the highest quantified impact was ionizing radiation (IR) (20.6 pers. equiv. and 17 pers. equiv., respectively), while the lowest was obtained in case of stratospheric ozone depletion (SOD) (0.184 pers. equiv. and 0.153 pers. equiv., respectively). A significant difference considering the environmental impact was identified regarding the contribution to the total quantified impact of the main applied processes. In case of *Arthrobacter viscosus*, a higher impact was determined in case of the biosorbent preparation phase (92,53%). However, for the application of *Saccharomyces cerevisiae*, the highest value was identified for the biosorption process (79,61%), the biomass preparation stage having a much lower generated impact (15.71%). This is explained by the fact that in comparison with the preparation of the bacterial suspension, the biomass preparation phase of the yeast didn't include the growth of the microorganism since it was obtained directly from industry. For both analyzed biosorption process flows the highest contribution among transport, process emissions and electricity were the one generated by the latter option. The current study thus shows the environmental impact of using two different types of microorganisms, bacteria and fungi, for Cd(II) removal from wastewaters through biosorption process. This research contributes to the development of the bioeconomy and of more environmentally-friendly wastewater treatment technologies that can remove metal ions even at low-concentrations.

## **RESEARCH ON THE DEGRADATION OF THE RIVERBED AND RIPARIAN AREA THROUGH HYDRODYNAMIC EROSION PROCESSES**

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The paper presents an analysis of the morphological degradation process of the riverbed and the riparian zone determined by the transit of a flood with very high flows. The studies and researches were carried out between 2016 and 2022 in the Moldova river basin, especially on the Moldova, Voronet and Suha rivers. The research carried out on the Voronet River after the disaster flood in June 2016 highlighted the complex action of water on the riverbed and the constructions in the riverbed and the riparian

area. An important morphological degradation took place on a sector located on the middle course of the Voronet River. The riverbed in this sector has been partially calibrated, because the riparian area is occupied by houses (right bank) and a road (left bank). The flood was produced by the precipitations that registered in two days a value of  $71.6 \text{ l/ m}^2$ . The runoff from the river basin generated a flow in the final section of the Voronet River of  $118.12 \text{ m}^3/\text{s}$  (calculation probability 1%). The flood presented a complex action on the riverbed represented by deep erosion of the riverbed, clogging by sectors and transport of natural and biological material with large volumes. The flood affected the human environment by degrading the county road on a length of about 1600 m, breaking bridges and footbridges, excessive degradation of shore defence works (about 2600 m), degradation of houses, outbuildings and others.

Keywords: clogging, erosion, flood, maximum flow, regularization works, road

## **HYDRODYNAMIC EROSION RESEARCH IN RIVERBED UNDERCROSSED BY PIPELINES**

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The paper presents a method for modelling the erosion phenomenon of riverbeds on sections limited in length of study. The research considered sections of the river on which various constructions are located in the riverbed. The model allows the evaluation of erosion depths on the perimeter of the flow section in various hydrological regimes and geotechnical conditions. The hydraulically-mathematically designed model is based on the equations of motion of a biphasic fluid (water + sediments) in whites with various geometric shapes of the flow section. The simulation model of the erosion-sedimentation phenomenon was solved numerically with the MATLAB program. The simulation of hydrodynamic erosion was performed on a river section with a length of 350 - 450 m, variable width (90 - 280 m), variable slope, water depths of 1.50 - 4.25 m. The flow of the river section was imposed by the study requirements specific to the riverbed constructions. By using the calculation program, the values of the tangential effort at the wall and the speed at the wall, the

erosion-sedimentation depths in characteristic points located in longitudinal profile and cross sections of the riverbed were obtained. The results obtained by modeling were compared with data calculated according to the design regulations and with the data collected by research in the study area.

Keywords: entrainment speed, erosion depths, tangential stress, simulation model

## **SPATIO-TEMPORAL VARIABILITY OF THE HYDROTHERMAL REGIME IN THE HOT PERIOD OF THE YEAR ON THE TERRITORY OF THE REPUBLIC OF MOLDOVA**

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The issue of knowing and highlighting the spatio-temporal variability of the hydrothermal regime during the warm period of the year, in the context of regional climate change, is becoming more current and very important. The great climatic variability attested in the last decades is accompanied by great material damages. Thus, in the years 2000-2018, practically the absolute maximums exceed the value of 36°C, the absolute maximum being reached in 2012 (42.4°C). The absolute maximum in the first decade of the 21st century (2000-2009) is 29.5°C, and in the thermal one the amplitude is 63.7°C compared to 51.2°C in the last decade of the last century (1989-1999). In the second decade (2010-2018) the absolute maximum temperature reaches values of 42.4°C. The thermal amplitude is 62.5°C. Such climate variability also occurs in the precipitation regime. Frequent alternations of dry periods with periods accompanied by torrential rains, attested mainly in the summer months, can directly influence the productivity of agricultural crops and, respectively, the income of the rural population in the republic. Also, increased variability in air temperature and the amount of rainfall can destabilize arable land, with the risk of flooding and the danger of landslides. Thus, the material damages caused by the torrential rains of the hot semester of the year on the territory of the republic for the period 1997-2018 amounted to 5256.9 billion lei, determined by large amounts of water, increased intensity and high frequency of these rains. The value of the damages caused by the torrential rains in the months of the warm semester of the year varies significantly from one month to another, both at the level of the republic and for each

administrative district being determined by the variation of the parameters of torrential rains.

## **EFFECTS OF NEW RESIDENTIAL DEVELOPMENTS ON URBAN SUSTAINABILITY IN THE IASI METROPOLITAN AREA**

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Starting from the well-known fact that urban sprawl is a driver of several complex and interrelated challenges for cities, evaluating the various economic, social and environmental consequences associated with the suburban expansion is an essential step towards efficient territorial planning and sustainable growth. To that end, this research is focused on understanding the implications and inevitable consequences related to urban growth in Iasi's Metropolitan Area within the last decade. We also aim to identify differences in local management among the rural communities while exploring the impact of those differences on the city. In order to pinpoint the predominant patterns at the metropolitan level, our research includes document analysis, data from a questionnaire-based survey, and remotely sensed datasets. The results were captured into a multitude of maps by using specific GIS-based techniques.

## **THE EFFICIENCY OF AGRI-ENVIRONMENT MEASURES WITHIN PNDR 2014-2020. CRITICAL CONSIDERATIONS**

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PNDR funding has three sources: The European agricultural guarantee fund (EAGF), the national budget and European Agricultural Fund for Rural Development (EAFRD). If the first two are intended rather for sectoral investments, with indirect spatial impact, EAFDR proposes financing for specific spaces, with direct environmental impact. Our communication, through quantitative and qualitative analyzes, aims to

assess the spatial coherence of EAFRD funding, which totaled over - 3.5 billion between 2014-2020.

## **DEMOGRAPHIC AGEING VULNERABILITIES IN THE NORTH-EAST REGION OF ROMANIA**

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The phenomenon of demographic aging can be considered a social hazard which, depending on its size, can produce strong socio-economic imbalances in the region or state in which it occurs. This phenomenon takes place independently and cannot be easily stopped by legislative measures, as it is known that the restoration of structural imbalances in relation to age requires a long time.

In Romania, the transformations that took place after 1989, in the political and economic system, in the social life, as well as in the mentality of the people, brought about important demographic changes. Therefore, the number of the population continuously decreased year by year the demographic aging along with the decrease of the birth rate and the increase of the number of emigrants being the main demographic phenomena that made their presence felt. These phenomena have manifested themselves mainly in rural areas.

This paper aims to highlight the scale of the demographic aging process in the rural areas of the North-East Region and to assess its socio-economic consequences in the medium and long term.

## **FAST FLOODS ON THE TROTUȘ RIVER IN THE CONTEXT OF CURRENT CLIMATE CHANGE**

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The paper presents an analysis of the flood formation module in a river basin with differentiated geo-physical characteristics on the location of the tributaries and the main course. The study area consists of the Trotus river basin. In the last 30 years, most floods with high flows have formed on the main course, namely the Trotus River. In 2004 there was a special situation defined by the formation of floods with high flows on the Piedmont tributaries, but which did not substantially influence the flow of the main

course. The floods produced on the river / stream / torrent type tributaries (Asau, Agas, Goioasa, Iedera) presented flows that exceeded the accepted calculation probabilities. The floods produced on the small tributaries were both the effect of the special precipitations concentrated in time, and especially the configuration of the lower sectors of the riverbeds. The year 2004 is distinguished by the way the floods evolved compared to the other years, when the maximum flows were present on the tributaries, and the main course (Trotus River) the values did not exceed the imposed limits. The slope of the tributaries decreases suddenly at the exit from the downhill in the Trotus river meadow. The sudden change of the slope determines the deposition of large volumes of transported alluvium, a situation that reduces the flow section of the riverbed and sometimes even its clogging. The result of the cooperation of these phenomena is highlighted by the great destructions produced in a territorial area with many human communities and important economic activities.

Keywords: comparative analysis, damage, maximum flows, precipitation

## **ENVIRONMENTAL IMPACT ASSESSMENT OF INDUSTRIAL ENTERPRISES IN THE NORTHERN DEVELOPMENT REGION OF THE REPUBLIC OF MOLDOVA**

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After the total emissions in the sequence of their diminution for a. 2010 on the first place is placed district (d) Drochia with the volume of 1030,906t, Balţi town with 901,252t, d. Rîscani - 691,812t, d. Donduşeni with 687,680t, d. Soroca 633,950t, Floresti district - 530,847t, Glodeni district 476,850t, Falesti district 392,248t. The lowest emissions in 2010 were in Ocnîţa district 231.60t, in Edineţ district the emissions were 177,791t, and in Sîngerei district the emissions in 2010 were 70.09t,

As a result, it can be concluded that in the period 2010-2020, in 2020 for all districts except mun. Balti and d. Soroca, total emissions decreased significantly. These data show that the greatest impact of the economic crisis caused by the Covid 19 pandemic has had a significant impact on the economies of the entire Northern Region, with the exception of Balti and Soroca. The significant reduction in emissions from industrial enterprises in the Nord Development Region has also led to a decrease in anthropogenic impact on the environment.

## **PHYSICAL STATE OF ARABLE CHERNOZEMS IN THE PRUT-DNIESTER AREA: FACTOR-PROCEDURAL ANALYSIS, TECHNOLOGICAL SOLUTIONS**

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In the current stage of anthropo-natural evolution of the arable chernozems of the Prut-Dniester space, the direction and intensity of typogenetic processes are determined by the qualitative-functional changes induced by agrogenesis, manifested in the interdetermined and interdependent degradation of pedofunctional system functionality [organic substances system-structural-aggregate system]. Their quantitative expression is the physical condition of the soils materialized in the physical (water, thermal, aeration) and pedofunctional (aerohydric, hydrothermal, biohydrothermal) regimes, which undergo significant changes, these being the main factor limiting the extended reproduction of the chernozemic process and natural fertility of arable chernozems. Their direct causes are the negative transformations of the structural-aggregate composition accompanied by the reduction of the total amount of accumulated organic matter and the degree of physical protection and its stability in the composition of the metastructural aggregates. The specified effects are exacerbated by climate change in the current climate trend in the region.

Our research has shown that structural-aggregate degradation is manifested in: increase in aggregate content >5 mm; reduction of the content of optimal agronomic aggregates 5-1 mm; increasing the compaction of the aggregates 3-1 mm and reducing their porosity below 40%; reducing the porosity of aggregates 1-0.25 mm below 30%; reducing the aggregate hydrostability below 50% and increasing the slitization of the structure.

The specified modifications lead to essential changes in the composition and functioning of the organic matter system: reduction of the total mass of bioenergetic resources and of the fraction of labile organic substances; increase of the share of humus in their composition; reducing the share of calcium humates and increasing the content of 'aggressive' fulvic acid fractions in the humic system; increasing the summary content of fulvic acids and reducing the ratio of Cah : Caf in the humus composition to values (1.5-1.2) uncharacteristic for chernozems. All this entails the

intensification of the processes of physical degradation with the intensification of the processes of degradation of the ecosystem functions of chernozems, especially of the bioproductive and carbon-sequestration function. A quantitatively functional expression of them is the increase of the vulnerability of soils to climate change.

In view of the concept of the priority role of the humification process in chernozemic pedogenesis, the technological solutions for unidirectional restoration of the direction and intensity of chernozemic processes presuppose the biologization of the anthropized chernozemic process.

An element of perspective in this regard is the use of bio-organo-mineral preparations based on humic substances that ensure: the restoration of the composition of the soil biota; increasing the biological and enzymatic activity of the soil; intensifying the processes of fixing biological nitrogen and increasing the amount of biological nitrogen included in pedogenesis; intensifying the production processes in the „soil-plant” system and increasing the amount of bioenergetic resources included in pedogenesis; intensification of the processes of formation and accumulation of humus and organic and organo-mineral nutrients; improving soil structure, hydrophysical and trophic functions; expanded reproduction of the natural fertility of chernozemic processes.

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## **TAXONOMIC STRUCTURE, ECOLOGY AND IMPACT OF INVASIVE PLANT SPECIES ON THE BĂLȚI URBAN ECOSYSTEM IN THE REPUBLIC OF MOLDOVA**

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Studies on invasive species have become more numerous in the last two decades, which has led to the development of a new branch in the field of ecology - the ecology of invasion. Knowledge of non-native, invasive or potentially invasive species in various ecosystems, as well as their impact on local plant communities is a priority in biodiversity research. Invasive species are modifying natural ecosystems by the: degrading fertility, modification the physico-chemical properties of the soil, degrading the quantitative and qualitative characteristics of the vegetation mat that compete aggressively with native species for water, light, area. These invasive plant species are a major current problem and a major threat to the

Earth's biodiversity. This paper aims to analyze the taxonomic structure, ecology and impact of invasive plant species on urban flora, economy and human health from the Balti urban ecosystem. Our research conducted in the Balti urban ecosystem over the last three years has shown that 18 non-native species, or 13% of their total number, are invasive species. Thus, we identified 18 species of invasive plants, which are part of 9 families, mainly species from the family Asteraceae, in number of 9, Brassicaceae with 2 species, and the other families with only one species. The study on the origin of invasive species showed that half of the numbers of species are North American, followed by the Eurasian, Mediterranean and South American center of origin. Invasive plant species of North American origin are the most common, which is explained by the fact that the climatic conditions of this continent are similar to those of the Republic of Moldova. Invasive species cause enormous economic damage to agriculture, forestry and human society. One of the invasive species that can cause allergic diseases or even intoxication of many people sensitive to their pollen is *Ambrosia artemisiifolia* L., which is a very aggressive species, native to North America, when it develops en masse it produces allergies, with effects of more diverse in those affected.

### **RISK ASSESSMENT OF ZINC DEFICIENCY IN MAIZE CROPS IN SOUTHEASTERN PART OF ROMANIA**

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Within the EU, according to Eurostat data, Romania ranks first in terms of agricultural area cultivated with maize, about 2.5 million ha. The study was conducted in southeastern part of Romania, an area with a share of approximately 19.2% of the total cultivated national area, in Ialomița, Călărași, Brăila, Tulcea and Constanța counties. The main purpose of the research was to evaluate the degree of zinc supply of the soils, and the nutritional status of maize plants with this microelement, for which, soil samples were taken from a depth of 0-20 cm and samples of plant in the phenophase of 4-7 leaves. The methodology for evaluating zinc regime consisted in determining the content of mobile Zn in soil, soluble in CH<sub>3</sub>COONH<sub>4</sub>-EDTA solution at pH 7; values calculation of the reaction-mobile phosphates index (RMPI) and the zinc deficiency index (ZnDI), in order to establish probability classes for zinc deficiency occurrence.

Results shows that of total analyzed samples (92), depending the content of mobile Zn by probability classes, 43% samples belonged to high probability class, 33% to medium probability class and 24% to low probability class, until improbable. Regarding percentage values of reaction-mobile phosphates index (RMPI), showed a distribution of soil samples, according to the probability class by zinc deficiency occurrence, of 68% for samples with high and very high probability, 22% for low probability and 10% improbable. Finally, the probability of this phenomenon occurrence, assessed by the zinc deficiency index (ZnDI), led to a distribution of percentage values as follows: 54% high and very high probability class, 21% medium probability class, 12% low probability class and 13% improbable class. The results obtained regarding the soils classification in probability classes of Zn deficiency occurrence in maize crop, provides precise information to stakeholders for the implementation of technological solutions to prevent this phenomenon that can cause significant production losses.

## **STUDY ON THE IMPACT OF ANTHROPOGENIC ACTIVITIES OVER SOILS FROM DEVELOPMENT REGIONS: NORTH, CENTER AND SOUTH OF REPUBLIC OF MOLDOVA**

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The ecological imbalance between the natural and anthropic ecosystems, the rugged relief, torrential rains, reckless privatization of the agricultural lands, condition the intensification of the soil degradation processes in the Development Regions (North, Center and South) of Republic of Moldova. The land resources in these three regions have a high degree of exploitation of natural resources with consequences on the ecological status. The anthropogenic impact on soil resources, the increase in the number of consumers has led to increased productivity of crops, at the same time this impact has also led to an extreme strain between economic activity and the natural environment, expressed by the depletion of natural resources. During the research period (2007-2021) an in-depth analysis was carried out on the structure of sowing crops used in the Development Regions. As a result of the studies carried out, there was a considerable increase in the share of technical crops both in agricultural enterprises and in peasant households (farmers), which exceeded over 33-43%, and in some districts over 48%-49 %. For example, in the NDR the highest share of technical

crops on average for the study period was found in the districts: Briceni (49.4%), Ocnita (49%), Edinet (47.9%), Riscani (46.9%), Dondușeni (44.9%). The average share of areas with technical crops on the NDR is 43.4%. In the districts of the Central Development Region the highest share of areas with technical crops is in the districts: Soldanesti (39,9%), Ungheni (35,5%), Rezina and Nisporeni each 34.3%. In the districts of South Development Region, the highest degree occupied with technical crops constituted 36%-39% for Basarabeasca and Leova districts. In the last years, also the share of areas occupied by hoeing crops has increased considerably. Currently, the share of hoeing crops in the structure of arable land sown with field crops and vegetables in the districts of the Development Regions: North, Center and South has increased on average in till 43.5%-50.4%, but in the Nisporeni, Straseni, districts up till 60%-65%. The increase of the share of hoeing crops in the mentioned Regions, which have a high degree of soil valorization, led to the intensification of erosion processes, to the loss of humus from the soil and to the worsening of the physic-chemical and biological properties of the soil. In different experiments, it has been shown that the cultivation of hoeing crops leads to the acceleration of mineralization processes and the establishment of a negative balance of humus in the soil. Each hectare of such sowings consumes annually, without taking into account erosion, over 1-2 tons of ha. The sown compact crops ranged on average for these three regions between 39%-51%.

**ANTHROPOGENIC PRESSURES ON THE INTEGRITY OF THE  
NATURA 2000 NATURAL PROTECTED AREA - ROSCI0380  
SUCEAVA-LITENI RIVER (SLR)**

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The protection and conservation of biodiversity is an important topic in the global political agenda for the sustainable development, which includes Romania. The aim of this study is to identify a series of measures to reduce or stop the negative anthropogenic impact on the natural protected area ROSCI0380 Suceava-Liteni River, measures which could be applied on other protected natural areas situated in anthropic areas from the Suceava County or Romania in general, measures that will not limit the economic development of the communities from these areas.

## **THE ROLE OF GREEN AND BLUE INFRASTRUCTURE IN THE STABILITY AND RESILIENCE OF URBAN ECOSYSTEMS**

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Urban ecosystems are dynamic ecosystems that have similar interactions and behaviors to natural ecosystems. Like any other ecosystem, the urban ecosystem is made up of physical and biological components that interact with each other. Urban areas include a combination of "gray" infrastructure (residential, industrial, commercial and transport infrastructure) and "green" and "blue" infrastructure. Green infrastructure describes all the elements of a network of connected green spaces that preserve the values and functions of natural ecosystems and benefit human communities. It consists of natural and anthropogenic elements, such as parks in urban areas, grassy roofs and walls, high-value agricultural land or high-conservation forests. Green infrastructure can preserve and create landscape features that guarantee that ecosystems will continue to provide services such as clean water, clean air, productive soils and attractive recreation areas. Thus, it helps the economy and society and makes an essential contribution to natural mitigation and adaptation to climate change. The "blue" infrastructure includes all the water bodies (swamps, rivers, lakes, canals) within an urban ecosystem, which together with the green infrastructure constitute the Ecological Infrastructure (EI). Green Infrastructure is a concept that determines the connectivity of ecosystems, their protection and the provision of ecosystem services, while also addressing climate change mitigation and adaptation.

Green infrastructure (forest plantations, forest-parks, agricultural land, hedges, road fences, etc.), blue infrastructure (land under water - swamps, rivers, ponds) and gray infrastructure (roads, streets and squares, constructions) were compared in cities and rural localities in the Northern Region of the Republic of Moldova. The results show that the spatial share of green infrastructure in the cities of the region with a population of more than 30 thousand inhabitants (Soroca town, Balti town) represents about 40-41% of the total area, the share of gray infrastructure is 50-60%, and of the blue one only 4%. In smaller cities, the share of green infrastructure can reach values of up to 60-70 percent, being strongly influenced by extra-urban spaces. In rural areas, the share of green infrastructure reaches about 80-90%, blue 2-3%, and built 10-12%.

Ecological infrastructure can perform various functions and bring multiple benefits within the same territory. These functions can be related to the environment (biodiversity conservation or adaptation to climate change), social (drainage or green space), and economic (job creation and rising property prices). Green and blue infrastructure contribute to the implementation of the policies promoted by the Water Framework Directive.

**DEMONSTRATING THE NECESSITY OF INTEGRATING  
MEASURES FOR REDUCING HABITAT FRAGMENTATION  
AND IMPROVING LANDSCAPE CONNECTIVITY IN THE  
MANAGEMENT PLANS OF ROMANIAN NATURAL  
PROTECTED AREAS**

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The protection of nature, including the conservation of habitats and species of community importance, is a fundamental objective for the European Union. Reducing landscape fragmentation and improving landscape connectivity are important necessities, both at European Union and global scale. The new EU's Biodiversity Strategy for 2030, the European Green Deal and The 8th Action Program for Environment (2021-2030) highlight nature conservation and reducing ecosystem degradation, member states having to implement complex policies and programs to attain the established targets. Maintaining and enhancing ecological connectivity among and between protected areas network, must be one of the priorities for the biodiversity conservation in Romania, given the ample benefits this would provide. Consequently, a range of measures for reducing landscape fragmentation and increasing landscape connectivity have to be integrated into the Romanian protected areas management plans. This study will demonstrate this necessity and will present a series of methods and instruments for evaluating the landscape fragmentation and connectivity, including protected areas connectivity relevant for species. It should be the basis on which priority measures should be designed and included in the protected areas management plans in the present and in the future. We consider the proposed analysis as an important instrument to improving the

management of protected areas and the conservation status for habitats and species.

## **AN APPROACH FOR ASSESSING SOCIAL VULNERABILITY RELATED TO GROUNDWATER RESOURCES AT LOCAL LEVEL IN NORTH-EASTERN PART OF ROMANIA**

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The studies concerning the assessment of social vulnerability have seen an increase in the latest decades, due to the negative effects induced by climate change. The current paper aims to analyze the social vulnerability associated with groundwater resources, at the smallest territorial administrative units' scale in Romania (176 communes). The vulnerability assessment was carried out based on 20 social and natural variables, classified using the Principal Component Analysis (PCA) method, into 6 main components. This type of analysis allowed for the computation of the Social Groundwater Vulnerability Index (SoGwVI) and determining its spatial extent at communal level. The results indicate the fact that 29.5% of the analyzed communes fall into the very high and high vulnerability class. Social factors such as: population density, decreased accessibility to a centralized water supply system, and the prevalent agricultural land use, associated with natural ones (low precipitation, decreased rock permeability and the hydrographic network) generate the aforementioned social vulnerability in Romania, especially in the Central and Eastern parts of the analyzed region. Integrating data pertaining to social, natural and hydrogeological conditions in the PCA analysis, and spatially extrapolating those using GIS instruments, greatly facilitates the interpretation process for the results, allowing for a much greater geographical context for the analysis.

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## **USING SENTINEL 2 SATELLITE IMAGES FOR ESTIMATING THE SPATIAL AND ALTITUDINAL DISTRIBUTION OF THE CONIFEROUS AND DECIDUOUS SPECIES FROM THE EASTERN CARPATHIANS**

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The morphometric characteristics of the terrestrial surface - especially the terrain elevation - are a determining climatogenetic factor, especially in the areas with high terrain fragmentation such as mountainous areas. The terrain elevation, the degree of fragmentation, the slope, as well as the orientation of the slopes are different characteristics of the terrain which have an important impact on the local climate. Thus, the morphoclimatic variability is reflected in the stratified distribution of the vegetation, determining the existence of the vegetal associations specific to each climatic area, more thermophilic species being specific to low terrain elevations. Using high resolution satellite images such as Sentinel 2, the spatial distribution of the tree species can be mapped, even for relatively large areas of interest. State of the art classification algorithms were used to extract and classify the forest cover. The resulted layer was used to determine the preferred morphometric conditions for the deciduous and the coniferous tree species.

## **RĂUȚ RIVER BASIN MANAGEMENT PLAN AND OPTIONS FOR NUTRIENT REDUCTION**

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Development of the management plan for the Raut river basin is necessary due to the: - identification of actual state of water quality and in general state of water ecosystems in the basin and preparing the program of measures for nutrient reduction activities, especially in the Balti town and rural localities - facilitation of cooperation between different level of authorities to implement nutrient reduction projects and to evaluate

capacities of local communities for relevant investments as well as capacities of local sectors to use the ecosystem services - calculation of scenarios for nutrient reduction and calculation of nutrient loads in the Raut river basin with overview of point and diffuse sources Actual load of nutrients in the Raut river basin could be estimated as: 100 kg/person/year for nitrogen and around 10 kg/person/year for phosphorus. Taking into account all population in the Raut river basin one could estimate total annual loads of nutrients as 100 tons of nitrogen and 10 tons of phosphorus. Thus, if there is a target for 25% nutrient reduction by the year of 2030, around 25 tonnes of N and 2,5 tons of P should be removed through different activities in the basin. Baseline scenario for agricultural development shows no significant changes in nutrient loads until 2030 with slight surplus due to the increasing of the fertilizers use. plantation of protected areas could reduce nutrient loads for 10-15% by 2030 and main issues of concern remain management of waste facilities. Implementation of waste water treatment Directive could (reconstruction fo WWTPs, storage of organic wastes, preparing of the compost etc) could assure nutrient reduction in the basin by additional 10-15% and thus achieve nutrient targets for 2030.

### **ASPECTS REGARDING FLOOD MITIGATION IN THE NON-PERMANENT ACCUMULATION CIUREA ON THE RIVER NICOLINA, IASI, ROMANIA**

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The non - permanent accumulations are formed by dry dams, and their only purpose is to mitigate the floods and to protect the downstream areas against inundations. The dam is designed to create a temporary retention of a significant volume of water, to reduce the flow peak on the river, to increase the total time of the flood, so that the negative effects of the flow are minimized. The non-permanent accumulation Ciurea on the River Nicolina (Iasi county, Romania) has proven usefull several times, since the time it was built. Along with accumulating an important part of the flood volume, the bottom outlet of the dam had a positive effect, because it has transited downstream a reduced flow, that fall within the maximum transit capacity of the river channel. The flows that occurred on the River

Nicolina, were smaller than the theoretical design flows, so the surface highwaters spillway wasn't put to function. This paper presents a review of the characteristics of the design floods and the significant events of this non-permanent accumulation.

## **ECOLOGICAL CONSEQUENCES OF WAR IN UKRAINE**

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The present-day war activities show their most evident consequence: deaths, war losses, destruction of residencies, ruination of industrial and infrastructure objects, huge migration flows, critical impairment of economics, worsening of social state of the major portion of population, and provocation of significant threats to the environment.

War impacts on the environment should be carefully studied and analyzed, as well as measures to help eliminate and level the same should be elaborated since environmental problems force the mechanisms that threaten social and economic sustainability.

All regions and sectors of Ukrainian economics as of these days are under continuous threat of stable ecological pollution raised by war activities.

Ecosystem disturbance, destruction of ecologically dangerous industrial objects, significant worsening of sanitary-hygienic parameters of potable water, disturbance of activity within natural reserves, threats of radioactive pollution - these are the war-resulting problems that cause today the biggest anxiety. The territories of the oblasts involved into active war operations suffer shelling, bombardments and movements of military mechanisms. This causes uninterrupted pollution of atmosphere, water and soils. It seriously impacts biodiversity, makes flora and fauna fall, harvests be lost, potable water reserves decreased, and landscapes changed. A certain portion of arable lands is already taken out of economic circulation, and sowing on a rather big territory is still impossible due to mines.

Mass shell explosions cause dust and gas clouds containing some poisoning gases and suspensions. Within a single period of time, the surrounding atmosphere is filled with huge portion of gaseous and solid pollutants that migrate with air flows and react thus forming dangerous combinations that fall on different surfaces, pollute plants, soils and water. The dangerous factors of pollution are as follows: air shock waves; ammo fragments; dust and gas clouds; smoke.

Anthropogenic environmental pollution manifests itself in the forms of atmospheric, water, electromagnetic, soil and noise contamination. Damages caused to industrial objects result in catastrophic ecological consequences such as ruination of stores that contain toxic and radiation matters; release into the atmosphere of nitrogen oxide, sulfur dioxide, carbon oxide, ammonia, etc.

Release of non-treated industrial sewage may cause pollution of water arteries.

Non-buried bodies of the dead are serious ecological problem, too. Biological remnants represent a source of dangerous bacteria that may appear in water or be transferred by animals. Biological material after body carrier's death is filled with harmful bacteria and corpse stick, which, when not buried, many times sharpen sanitary-epidemiological situation.

Unfortunately, there now exists no possibility of ecological control over considerable part of Ukrainian territory; the factual absence of controlling bodies on occupied territories and uninterrupted shelling allow for no objective assessment of harm caused to environment during the armed confrontation. At the same time, the regions and territories where there are no war operations become zones of ecological tension, too. The increase of internal migrants' overloads water supply net, increases wastes and air pollution from moving sources thus disturbing the environment and ecosystems.

So, direct war activities seriously impact the regions of war operations, and their consequences will be sensitive for many years. It will in the first place tell on the landscapes, lead to losses in biodiversity, fires within ecosystems and subsequent chemical pollution of the territories, active contamination of soils and water sources with oil products.

Thorough attention in conditions of war should be paid to probable ecological consequences which should be studied in their whole complex since environmental problems may transform into threats of economic and social nature.

## **CONSERVATION TOOLS IN ASSESSMENT OF PROJECTS EFFECTS ON NATURA 2000 SITES**

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The Natura 2000 network includes sites declared for the protection of rare and endangered species and habitats, included in the Birds Directive and

the Habitats Directive. In Romania, the Birds Directive and the Habitats Directive have been transposed by the O.U.G. no. 57/2007 on the regime of protected natural areas, conservation of natural habitats, wild flora and fauna. Thus, according to Article 28 (2) of the normative act, any plan or project that has no direct link or is not necessary for the management of the protected natural area of community interest, but which could significantly affect the area, alone or in combination with other plans or projects, it is subject to an adequate assessment of the potential effects on the protected natural area of Community interest, taking into Not all Natura 2000 sites declared in Romania have a management plan. For many of the sites designated in 2016, management plans have not been developed and no conservation targets have been set until 2020, in line with Article 6 (1) of the Habitats Directive. Economic activities may be carried out on the surface of Natura 2000 sites, in compliance with the conservation objectives established for the conservation of species and habitats in those areas, the environmental legislation in force and the measures established by the management plans. In January 2020, the European Commission sent a letter with comments on the construction project of the Bacău Bypass, including the fact that the impact of the project was not assessed according to the specific conservation objectives for the possibly affected sites, respectively ROSCI0435 Siretul Middle, ROSPA0138 Piatra Șoimului-Scorțeni-Gârteni and ROSPA0063 Lacurile de acumulare Buhuși-Bacău-Berești. ROSCI0435 Siretul Mijlociu and ROSPA0138 Piatra Șoimului-Scorțeni-Gârteni, which do not have a management plan, did not have established conservation objectives, and for ROSPA0063 Buhuși-Bacău-Berești Reservoirs, the management plan does not provide specific conservation objectives for species protection of birds of Community importance. The project was suspended from funding until the requested clarifications were submitted. The National Agency for Protected Natural Areas, as the responsible authority, has developed the procedure for formulating and adopting specific conservation objectives for Natura 2000 sites. The specific conservation objectives were formulated, approved, according to which the evaluation of the project was made according to the factual objectives that contributed to the unblocking and completion of the bypass. This paper aims to analyze the impact reduction measures imposed for large infrastructure projects in Bacău, partially carried out at the Natura 2000 site ROSCI0434 Siretul Mijlociu and ROSPA0063 Buhuși-Bacău-Berești reservoirs, depending on the parameters and target values established by the Objectives of specific preservation.

## **THE AIR IONIZATION IN SUCEAVA METROPOLITAN AREA. PRELIMINARY RESEARCH**

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The air in the immediate vicinity of the Earth's surface is characterised by the chemical, compositional and also physical properties such as: the electric field, electrical conductivity or degree of ionization. The aeroions have a considerable influence on the quality of the air we breathe, on human life and health. Therefore, the ion-generating process and the properties of aeroions have been continuously investigated during the 20th and early 21st century by many atmospheric and medical scientists. The monitoring of the air ionization for Suceava Metropolitan Area (AMSV) was performed with the PC Connectable Highly Accurate Air Ion Counter Tester COM-3200PRO II. So far, we have monitored the aeroion load in the AMSV atmosphere at 34 points, in two time sequences in two representative winter and spring months (in the intervals 08-09 respectively 15-16 January 2021 and 25-27 March 2022), at different times of the day, on active surfaces differentiated in properties, to capture their role in the aeroionization process and also the temporal, but especially spatial differentiations of aeroion levels induced by them. At each point, on each day in January and March, the determinations were made in 10-minute time sequences (4 x 10-minute sequences for negative ions plus 4 x 10-minute sequences for positive ions for January 2022 - in total 40 minutes for negative ions and 40 minutes for positive ions; 3 x 10-minute sequences for negative ions plus 3 x 10-minute sequences for positive ions for March 2022 - in total 30 minutes for negative ions and 30 minutes for positive ions). The average level of the positive aeroions averaged over the whole AMSV was 665.65/cm<sup>3</sup> air in the interval 08-09, respectively 15-16 January 2022 and 476.56/cm<sup>3</sup> air in the interval 25-27 March 2022, and that of negative aeroions was 119.09/cm<sup>3</sup> air in the interval 08-09, respectively 15-16 January 2022 and 295.16 cm<sup>3</sup> air in the interval 25-27 March 2022. Certain geographical features (presence of areas covered with spontaneous vegetation of grasses, shrubs, trees - at the observation dates these were not being in the vegetation stage - or aquatic, compared to highly humanized and industrialized areas) and temporary local manifestations of the meteorological processes (intervals with wind intensities or solar radiative flux intensities, etc.) generated aeroion concentrations (positive/negative) that deviated positively in a large extent from the average values. By comparing our results with other results, we can state that the aeroion levels

in the AMSv fall within the normal values considered for the relief step in which it is located, but the deviations, sometimes particularly large, were influenced by local characteristics of the active surface and socio-economic activities, as well as by the local manifestations of some meteorological phenomena, such as gusty winds.

## **THE EVALUATION OF THE CLIMATE AND THE BIOCLIMATE IN PIATRA NEAMȚ FOR THE INHABITANTS, TOURISTS AND TOURISTIC ACTIVITIES**

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The relation climate-tourism is nowadays analysed in a series of studies which aim the climatic and bioclimatic features of the touristic resorts, but also the potential of the different destinations. More than that, there exists a relation of dependence between tourism and climate. The meteorological elements as the temperature, the precipitations, the nebulosity or the wind can influence the attraction degree of a touristic destination. As the majority of the touristic activities are outdoor activities, the meteorological and climate conditions can function as attraction or constraint factors. In this survey we aimed to evaluate the bioclimatic potential of Piatra Neamț resort, starting with the PET indicator and continuing with the output of a climatic and touristic scheme (CTIS). Our research emphasises a series of connections between the climatic conditions and planning, developing and functioning of the tourism, as well as between the climate and the motivations and expectations of the tourists visiting Piatra Neamț resort.

Key words: PET indicator, CTIS, bioclimate, Piatra Neamț

## **VULNERABILITIES REGARDING SUSTAINABLE MANAGEMENT OF THE TOURIST POTENTIAL OF MOUNT COZLA**

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Tourism can be considered as an economic sector sensitive to various risk factors, in particular climatic, hydrological and geomorphological, which induce visible effects on tourism activities and the sustainability of that sector. The present study aims, through an approach based on documentary and statistics, field research and interview technique, to highlight some

vulnerability aspects regarding the sustainable exploitation of the tourist potential of Mount Cozla in Piatra-Neamț municipality.

Summarizing various types of tourist potential with many possibilities of exploitation, Mount Cozla is a main component of the tourist structure in Piatra-Neamț, being strongly integrated into the urban-functional system of the city. The tourist importance of this mountain lies in the concentration of a varied tourist potential, both natural and anthropic, supported by good accessibility due to the low altitude and proximity to the city: climatic and recreational (possibilities for walking, hiking and practicing various sports), balneary (presence of mineral springs), cultural-historical (presence of archaeological remains and historical and cultural objectives). Exploiting the tourist potential of Mount Cozla has been a permanent concern for the local community, through the development of specific and complex infrastructure. Recently, several projects for transport and sports activities have materialized, such as: cable car, two ski slopes with different degrees of difficulty, night ski facility and ski lift. The ski slope (inaugurated in 2009) is an ambitious tourist project, but due to the low altitude of the mountain (670 m), the poor rainfall and the high temperatures during the winter season, it was opened intermittently, operating only between 2009-2015 and 2018-2019. Also, geological and geomorphological characteristics favor mass displacement processes on slopes, landslides being the processes with the highest frequency and posing the highest risk to the specific infrastructure. They currently affect the secondary ski slope on the eastern side of the mountain.

The study confirms that any development project needs to be supported by serious studies on investment payback vulnerability assessment to the impact of hazards or risk phenomena. In this case, geomorphological and climatic hazards delay the sustainable management of local tourist potential and the sustainable contribution to the economic development of the community.

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## **USING NASA'S FIRE INFORMATION FOR RESOURCE MANAGEMENT SYSTEM (FIRMS) TO EVALUATE THE IMPACT OF WAR IN UKRAINE ON ENVIRONMENT DURING THE FIRST MONTH OF CONFLICT**

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Launched February 24th, 2022 by Russia, the full-scale war against Ukraine has also a heavy impact over all environmental components. Tens of thousands of shells and missiles were launched against the Ukraine territory provoking thousands of fires all over the country, impact craters outside the built areas, heavy damages on carburant deposits, pipelines, sewage networks and residential areas. NASA's Fire Information for Resource Management System (FIRMS) Near Real-Time (NRT) active fire data, which are distributed within 3 hours of satellite observation from the Moderate Resolution Imaging Spectroradiometer (MODIS) aboard the Aqua and Terra satellites, and the Visible Infrared Imaging Radiometer Suite (VIIRS) aboard S-NPP and NOAA 20, was used to estimate the total area impacted by fires in the first month of war.

## **ANTHROPOGENIC IMPACT ASSESSMENT IN NATURAL PROTECTED AREAS (A CASE STUDY: ROSCI0040 COASTA LUNII, ROMANIA)**

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In the context of upcoming challenges related to climate-change and land-use modification, the management of natural protected areas is becoming increasingly important. The ROSCI0040 Coasta Lunii (682,9 ha) has been designated to preserve three types of habitats (6240\* Sub-pannonic steppic grasslands, 40A0\* Subcontinental peri-Pannonic scrub, 91I0\* Euro-Siberian steppic woods *Quercus* spp.), three species of invertebrates, two of amphibians and one plant species. For the current study, the relevant

impact sources have been identified, by using specially adapted check lists. Furthermore, the impact intensity has been determined by using a Rapid Impact Assessment Matrix (RIAM). Then, the results have been interpolated using the Inverse Distance Weighted (IDW) GIS technique. The results show that the main negative impacts are: intensive and non-intensive grazing, artificial afforestation with non-native trees, illegal collecting of insects, reduction of habitat connectivity, changes in species composition (succession), and the increase in intensity and frequency of droughts. Additionally, grassland and forest fires could be a serious threat for the protected habitats and species in the future. In this study, several conservation measures have been proposed in order to improve the conservation status of the natural protected area. The methodology applied could be seen as a model of good practice for the assessment of pressures and threats in other similar areas.

## **SOIL HEALTH: CONCEPTUAL AND METHODOLOGICAL APPROACHES**

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The end of the 20th century the beginning of the 21st century was marked by the formulation of the basic principles and categories of the concept of "soil health" in many publications of a series of pedologists-ecologists in which soil is examined in the context of: a) supporting plant and animal productivity (agronomy); b) supporting and promoting soil biodiversity, water and air quality, sequestration and stabilization of organic carbon (environmental approach); c) ensuring human health (socio-economic approach) (Doran et al., 1996; Doran Zeiss, 2000; Van Bruggen, Semenov, 2000; Kinyangi, 2007). Among the priorities of this concept we mention a turning point in the examination of soils from utilitarian positions to the biospheric examination as a central link of both natural and anthropogenic terrestrial ecosystems. In this context, the concept of "soil health" implies the systemic, real objective evaluation of both bioproductive capacity of soils and their unidirectional functioning capacity in relation to the other components of ecosystems, but also to the related geosystems (hydrosphere, atmosphere, lithosphere). In this sense, within the concept of

“soil health” the latter is no longer considered only an inert environment of providing the plants with the necessary ones (water, air, heat, nutrition, etc.), lifeless, which modern intensive agriculture (including so-called conservative, which is based on the same intensive elements, except tillage) tends to represent it, but a living, dynamic environment in constant change, reproduction and evolution. In the context of the above, we consider that "soil health" is a biospheric category, which examines the soil as a bioroutine / parabiotic system quantitative expression of the state and dynamics of biotic component activity within the soil bioorganomineral complex. In this sense, “soil health” implies examination of soil as: a) a stable-functional factor to ensure the bioproductivity of natural and anthropogenic biogeocenoses, as well as the diversity and evolution of soil biota; b) energy storage and biophilic elements, which ensure the stability of the potential bioproductivity of terrestrial ecosystems, their continuous operation; c) the link between the large geological circuit and the small biological circuit of substances; d) unique biosystem that modelate, protect and reproduce the quality of the environment. Quantitatively, this category is characterized by biopedofunctional parameters appropriate to concrete land conditions, biological, biochemical, biophysical processes materialized in the degree of closure of carbon circuits and biophilic elements and their stability to the pedoturbation impact of biotic and abiotic stressors. In terms of the concept of “soil health”, its functions in terrestrial ecosystems are to be divided into three categories responsible for: 1. Environmental safety - extended reproduction of the functions responsible for the health of environmental components and extended self-reproduction of the pedogenetic process; 2. Food security - extended reproduction of the functions responsible for the quantity and health of plant and animal production; 3. Human health - extended reproduction of the functions responsible for the health of people's living environment. At hierarchically lower levels, soil functions are divided according to biopedofunctional mechanisms and effects. Based on the above, a first variant of the soil health management model was elaborated by biologicalizing the anthropo-natural pedogenesis.

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**SEVERE DROUGHT MONITORING BY REMOTE SENSING  
METHODS AND ITS IMPACT ON WETLANDS BIRDS  
ASSEMBLAGES IN NUNTAȘI AND TUZLA LAKES (DANUBE  
DELTA BIOSPHERE RESERVE)**

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The present paper aims to highlight the impact of the partial or total drying of the Nuntași and Tuzla lakes (from the Danube Delta Biosphere Reserve) as a result of intense drought phenomena on groups of waterfowl that are encountered in this region. Our analysis combined satellite remote sensing techniques with bird observations that were made monthly during the analyzed period, corroborated with the meteorological context of the time interval that was taken into account. The results of the satellite image processing show a partial drying in 2013 and a total drying in 2020 of the Nuntași and Tuzla lakes, which were caused by both natural factors (drought) and anthropogenic factors (inadequate management of the area e.g.: communication channels with surrounding lakes are clogged). These situations have led to repercussions for groups of birds, which behave differently depending on their ecology. Pelicans and swans are the most affected birds, they leave the area in the absence of water, whereas gulls and terns are not affected by the decrease in the water surface, they even increase their numbers in such conditions. Our study also shows that from 2010 to 2020 the largest numbers of birds (total numbers of birds), with the exception of pelicans, were recorded in 2013 and 2020, more precisely in the years when the water surface decreased considerably. Another important feature of this paper involves highlighting how fragile an ecosystem can be in the context of climate change, but also how important it is to involve human society in maintaining the adequate conditions for an ecosystem that is part of one of the most important biodiversity hotspots on the planet, the Danube Delta Biosphere Reserve.

Keywords: remote sensing, drought impact, aquatic birds, Danube Delta Biosphere Reserve

**THE STATIONAL AND POTENTIAL FAVORABILITY OF  
FOREST HABITATS FOR PLANT AND ANIMAL SPECIES  
LOCATED IN ROSCI0076 DEALUL MARE-HÂRLĂU**

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Protected areas pose a major interest in the current context in which natural habitats are very fragmented as a result of economic development. The ROSCI0076 Dealul Mare-Hârlău site represents the largest protected area from Moldova's Plateau where forest habitats occupy a majority surface. A total number of 10 Natura 2000 forest habitats were identified on the site's surface. Among them, the majority are 91Y0 - Dacian oak hornbeam forests and 9130 - Asperulo-Fagetum beech forests. These are comprised of 79% natural forests, while planted forests represent 19%. The main age ranges between 40 and 80 years, with compact areas with young forests, as well as with forests older than 100 years. Forest habitats are stable from an ecological point of view, ensuring optimum conditions for the development and colonization of species presented on the site's map.

Keywords: Moldova's Plateau; ROSCI0076 Dealul Mare- Mare-Hârlău forest habitats; Natura 2000

**INTEGRATING MULTIPLE DATA SOURCES TO INFER  
TROPHIC RELATIONS BETWEEN CARNIVORES IN EASTERN  
CARPATHIANS**

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Eastern Europe is one of the few places that harbor an intact terrestrial carnivore guild, with the Carpathians acting as the stronghold for European carnivores, as there is increased recognition that humans, through direct (e.g., exploitation) and indirect effects (e.g., land use change, forestry, hunting, livestock production, and farming) may have a critical role in

shaping trophic relations in animal communities. Images collected from 50 camera trap stations installed in Eastern Carpathians were analyzed the impacts of potentially dominant apex carnivores on the occupancy and detection of a mesocarnivore to understand potential impacts reintroductions of apex predators may have on smaller carnivores. Material was collected and analyzed from terrestrial carnivore species: gray wolf (*Canis lupus*), Eurasian lynx (*Lynx lynx*), brown bear (*Ursus arctos*), wildcat (*Felis sylvestris*), red fox (*Vulpes vulpes*), as well as several mustelids: badger (*Meles meles*), European pine marten (*Martes martes*), beech marten (*Martes foina*), stoat (*Mustela erminea*), and least weasel (*Mustela nivalis*) ungulates: roe deer (*Capreolus capreolus*), red deer (*Cervus elaphus*), wild boar (*Sus scrofa*) and chamois (*Rupicapra rupicapra*). We use multispecies occupancy model of two or more interacting species (Rota et al. 2016), structural equation models (SEM) to explore how environmental and anthropogenic variables affect the marginal occupancy (occupancy without accounting for interactions with other species), co-occupancy (overlap in marginal occupancy between species), and conditional occupancy (effects of each species presence on other species detection and occupancy) of lynx, wildcat, and wolf in the Romanian Carpathians.

## **SUSTAINABLE URBAN REGENERATION AS AN OPPORTUNITY TO REDESIGN URBAN CORES**

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The process of urban regeneration represents an opportunity for the sustainable reconfiguration of cities. This paper aims to present two good practice models of mixed-use real estate developments, by developing integrated concepts, with major impact on local urban and economic development, without being invasive. The two integrated urban regeneration projects are centrally located in first-tier cities in Romania and developed as a result of private initiatives, which aim at both the sustainable development of local communities and harmonization with the existing urban landscape. In order to meet the requirements of sustainable development, the projects are developed in such a way as to comply with the principles of "walkable cities", which not only facilitate pedestrian access but also encourage it by allocating large spaces to pedestrians and ensuring connectivity with the city through alleys and green spaces. The

paper follows the spatio-temporal evolution of the projects, both in terms of environmental impact and economic and social.

## **ESTIMATION OF THE DIRECT COSTS FOR WATER SUPPLY OF THE LOCALITIES FROM THE REPUBLIC OF MOLDOVA WITHIN THE LIMITS OF THE DNIESTER RIVER BASIN**

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The results of the research presented in this paper were obtained in the third stage (2022) of the Institutional Application Project "Assessment of the stability of urban and rural ecosystems in order to ensure sustainable development" implemented by the Institute of Ecology and Geography.

The National Development Strategy "Moldova 2030" is the fundamental act that sets the long-term goals of sustainable development of the country, and the Medium Term Budget Framework (MTBF), sets the political priorities of public revenues and expenditures covering the entire National Public Budget (NPB).

The methodology for estimating direct costs for water supply is developed in accordance with: the provisions of the WATECO Guide on the methodology of economic evaluation of water uses for the implementation of the Water Framework Directive 2000/60/ EC, with the River Basin Management Plans implemented in neighboring states and the Republic of Moldova. The basis of this study was the principle of complementarity of the 3 T (Tariffs, Taxes, Transfers), where only transfers and tariffs were analyzed, because taxes are indirect costs and represent the sources of formation of transfers from the state budget.

The direct cost paid from public resources in the water supply sector is expressed by the amount financed from the state budget for measures to ensure access to safe water sources correlated with the severity coefficient of the risk criterion, which for the water supply sector constitutes 0.1. Funding is provided through the National Ecological Fund, the National Fund for the Development of Agriculture and Rural Environment, the Regional Development Agency North, Center, South. In 2020, 86 projects were funded in the Dniester district, with an average of 3-4 actions for each administrative unit. The calculation included 24 territorial administrative units including the municipalities of Balti and Chisinau. In the last 10 years, public resources have incurred direct water supply costs in the Dniester district, financial resources amounting to  $\approx 11.9$  million USD, or  $\approx 1.2$

million USD annually. The highest costs were achieved in 2014 ( $\approx 1.6$  million USD). In 2017, the lowest direct costs for the sector were identified ( $\approx 0.1$  million USD). This is due to the reorganization of the funds that finance this sector. The general trend of direct costs from public resources for the water supply sector of the population of Dniester River Basin is a positive one, increasing by about 4.7 times.

When determining the average cost of the water supply service, the region included the municipality of Chisinau and Balti. The average cost per cubic meter of water delivered by local and municipal operators in the Dniester River Basin has increased  $\approx 2$  times, or by 9.3 lei/m<sup>3</sup>, from 9.6 lei/m<sup>3</sup> in 2010, to at 18.9 lei/m<sup>3</sup> in 2019. The largest increase in the average cost for 1 m<sup>3</sup> is attested in the districts: Soroca ( $\approx 4.8$  times), Glodeni ( $\approx 3.6$  times), Telenesti ( $\approx 2.9$  times). In Rezina, Soldanesti and Straseni districts, the average cost increased insignificantly, varying from 1 to 1.2 times. Analyzing the data on the evolution of the average tariff and the average cost per 1 m<sup>3</sup> of water supplied by the operators, it is found that the average tariff increased by 60% slower than the average cost per 1 m<sup>3</sup> of water delivered. Consequently, we obtain a negative difference between the average tariff and the average cost of water supply in the study region. To remedy this difference, it is recommended to adjust the tariff for the water supply service and subsidize consumers from budgetary resources, so as not to accelerate the current inflationary process.

## **ENVIRONMENTAL POLICIES AND ENVIRONMENTAL HEALTH**

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Environmental health, on which human health depends, is the consequence of legislation that is the framework for environmental action. Man, in relation to his natural and cultural environment, has experienced his ability to "control" nature. The process of using natural resources and degrading the environment is opposed, as a real necessity, by the desire for conservation. Declaring natural areas with protection status, investing material and community resources in measures to stop degradation are normal actions in an increasingly technological and polluted society. Protective measures are guided by public policies. Public policies,

including environmental policies, are the prerogative of central authorities in the field. What happens when these policies are developed without calculating an environmental impact? The environment becomes vulnerable. Environmental vulnerability translates into biodiversity loss and reduced environmental services. The decline of natural ecosystems is reflected in the decline of human health. The current trends are to develop human society, to increase the degree of comfort. It is considered that natural resources are unlimited, that nature has enough resources to regenerate (for example, water is a renewable resource and can be purified by passing "over seven stones"). Are these resources unlimited? Is it the right way to handle them? Are the realities, the current state of the environment, taken into account in decision-making and especially in the elaboration of public policies? This paper will focus on how the management of protected natural areas can be influenced by public policies without being able to exhaust this controversial topic.

## **PRELIMINARY RESULTS ON THE MOST USED REMOTE SENSING TOOLS IN FOREST MONITORING**

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The importance of forests is due both to the fact that they represent the most extensive type of use in the world and to the fact that they have multiple implications in human society, from household needs (fuel for heating, fuel for cooking) to industrial use (from wood for construction to the pulp and paper industry). As this resource is exploited for a variety of purposes, it is difficult to monitor it, which is why the use of remote sensing methods can ease this process considerably. In this paper we present a set of preliminary results that address the peculiarities of monitoring forest surfaces by remote sensing methods observed in other studies over the last 3 decades. According to the web of science, following a keyword search ("forest remote sensing"), the United States is the world leader in terms of published scientific articles, followed by China and Canada. In terms of citations, the USA and Canada are in the top two places, followed by China. In our study we also noted differences in the instruments and methods used, for example North and South America use AVHRR, Landsat and MODIS satellites in the majority, while in Europe Sentinel 1 or 2 are the most used.

Key words: forest monitoring, remote sensing, satellite

## **RECENT TRENDS IN INTERNATIONAL POPULATION MIGRATION IN MOLDOVA (ROMANIA)**

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Major events in recent years have clearly influenced all aspects of the socio-economic life of our society. Certainly, the phenomenon of international population migration could not escape this evolution. From departures to returns, remittances and professional integration at the destination, the changes induced in recent times deserve to be analysed from a geographical point of view.

## **CHANGES OF FOREST STATE USING VARIOUS BIOPHYSICAL INDICATORS**

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The forest is integrated in the mechanism of terrestrial ecological systems, ensuring the regional climatic balance, the normal and coherent functioning of the hydrographic basins, the prevention of land degradation, the attenuation of the reduction of biodiversity and different resources for the society. This function of the forest ecosystem depends very much on the quality of the forest, not just its quantity. The fundamental way to improve the quality of forests, which could also preserve the functions of ecosystems, is their sustainable management. With the increasing availability of high-resolution satellite imagery, studies can be made to highlight the changes that are taking place in forest and tree species, by using vegetation indices derived from spectral bands. The main purpose of this study was to find out the differences between forest tree species in the Natural Park Putna Vrancea, using biophysical indices derived from Sentinel 2 images. In order to do that, was chosen images within the visible and infrared range of the electromagnetic spectrum for 2017-2021 period. Before calculating the biophysical indices, the images were pre-processed

in the SNAP program, applying atmospheric correction, resampling, subset and reprojection operations. The analysis was based on Normalized Difference Vegetation Index (NDVI), Leaf Area Index (LAI), Fraction of Absorbed Photosynthetically Active Radiation (FAPAR), Fraction of Vegetation Cover (FCOVER), and Canopy Water Content (CW), that were compared with field data. These indices use the spectral information of 11 normalized data: B3, B4, B5, B6, B7, B8a, B11, B12 and directional information. The results show the high potential of Sentinel 2 images for these types of analyses, in which it can be observed the forest state.

Keywords: Remote Sensing, Changes, Forest, Sentinel 2, Biophysical Indices

## **THE MONITORIZATION OF THE LAKE WATER QUALITY PARAMETERS THROUGH SATELLITES AND SENSORS**

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The use of remote sensing data in water quality monitoring has become useful and important in recent years. The information as quantitative data on water characteristics can be obtained much more easily and quickly. However, satellites and sensors used in the analysis of water quality parameters are just as important. In recent years, the monitoring of water quality parameters has focused mainly on the development of algorithms that use different combinations of bands in the visible and infrared field of the electromagnetic spectrum. By using sensors with moderate resolution, we may not obtain the appropriate information for the analysis we perform. In this case, the Sentinel 2 images are suitable for the analysis of water quality parameters, and can reach a resolution of 10 m. The main purpose of this study was to assess the accuracy of the Sentinel 2 images by using different algorithms and methods to calculate parameters of water quality in lakes, such as chlorophyll-a, total suspended matter (TSM) and turbidity (TU) for a period of 5 years. As well, were used infrared thermal bands (TIR) of MODIS optical sensors In order to determine the water surface temperature, correlated with Sentinel 2 images. Parcovaci, Tansa, and Podu Iloaiei lakes being monitored by the Prut-Barlad Water Basin

Administration, located in the NE part of Romania with multiple uses, such as flood protection supply of settlements, irrigation, and fish farming. 15 Sentinel-2 Level 1C - Top of Atmosphere products were used in the SNAP software, which were preprocessed, then geometric and atmospheric image correction was performed. In the end, the focus was on B4, B5, B6, B7 reflection bands, which represented the input data for testing the empirical equations to calculate water quality parameters. The distribution of parameters was determined for three sections of the tanks: tail, middle and dam. Were monitored 3 seasons, and the summer season shows exceeded the maximum allowed limit, indicating a predominantly hypertrophic and secondary oligotrophic, mesotrophic and eutrophic ecosystem. The analysis of Sentinel-2 images is useful for monitoring water quality parameters, especially if are used the correct steps of the methodology, in the right order. All of these can be useful sources of information that can be used for complex assessments of the trophic status of barrier lakes. Keywords: Remote sensing, Sentinel 2, Chlorophyll-*a*, Total suspended matter, Turbidity.

## **USE OF DERIVED SPECTRAL INFORMATION FOR CLASSIFICATION OF THE CROP TYPES**

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One of the biggest challenges, which affects people's livelihoods and the environment, is land degradation, with effects on climate change, but also on the loss of productivity and biodiversity, being the result of the discrepancy between land quality and cultivation intensity. Remote sensing data can provide information on crops by calculating different vegetation and / or soil indices. To be able to create maps with different types of crops, for many years plays an important role, from environmental to economic. The advantage of using satellite images in the study of crops is that the information can be extracted in a relatively short time, only benefiting from an adequate infrastructure, without interfering with the lands / crops. The main objective of this study was to evaluate the accuracy of the information obtained after the Random Forest classification over a period of 2 years, crops that were affected by land-use changes and soil properties. The study area was in Valea Oii catchment, Romania (47°21'0.86" N to 47°13'23.32" and 26°49'37.07" to 27°10'35.68" E), an elevation between 64 and 425 m

(110 m to Baltati), a continental climate with an average annual temperature range of 8-10.4oC and an annual precipitation of 500-700 mm. 62% of the area is represented by agricultural uses, respectively 3700 ha other land uses, with chernozems (60 %) and phaeozems (10 %) followed by anthrosols (12 %) and aluviosols (6 %). More precisely, the study was conducted in the Baltati area (4518 ha), part of the Valea Oii catchment. Land use changes, without a correlation between soil and crop type, lead to affecting their quality and quantity. In this analysis, soil and vegetation indices were used, such as NDVI and NDWI, BI, SBL, and GOSAVI, which aimed to highlight the vegetation, being able to differentiate the types of crops. Also, the Random Forest algorithm was used for the classification of crop types, by introducing various indices in the model, and the resulting information was validated with field data. The results show a high accuracy of the information, making this research a particularly appropriate approach when land management measures are required, as in soil complexes involving degraded land. The results show a high level of information accuracy, making this research a particularly appropriate approach, especially when land management measures are required.

Keyword: Sentinel 2, Vegetation and Soil indices, Random Forest.

## **EXAMINING TRENDS IN FOREST ABOVE-GROUND LIVE BIOMASS IN ROMANIA AFTER 1987**

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This research explores the recent trends (1987-2018) of forest above-ground live biomass (AGB, in tonnes/hectare or t/ha) in Romania, based on multiple remote sensing (Landsat) and forest inventory (permanent sampling plots) data that were analyzed yearly (in the summer season) across Romanian forestlands, using a series of complex statistical algorithms. After modelling interannual AGB data, the resulting yearly raster values were explored as trends (in terms of direction, magnitude and statistical significance) over the 32 years, using the Sen's slope estimator and Mann-Kendall test. A large volume of climate data was also processed, in order to detect possible statistical relationships between climate and forest biomass. The results showed that, while ~70% / ~30% of the total

area of national forest changes was affected by increasing / decreasing trends, about half / one fifth of all positive / negative AGB trends are statistically significant nationally. At the same time, an average AGB increase of ~3 t/ha/yr and a total forest biomass gain of ~6.4 Mt (megatonnes) were found in Romania, over the entire 1987-2018 period. Also, only a low to moderate climate change impact in forest biomass dynamics has been detected throughout Romania. All findings of this study may be useful to various forestry stakeholders and policymakers operating regionally or centrally in Romania.

## **PRELIMINARY QUANTITATIVE ASSESSMENT AND SPATIAL DISTRIBUTION OF TAILINGS PONDS IN ROMANIA**

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Storing mining waste in settling ponds has been proven to be the most viable solution from an economic perspective but, over time it has been revealed that this method is unsustainable on the long-term, the costs of greening and maintaining the dams being very high and the risk of dams breaking being greater as they age. At global level, the eventuality of settling pond dams being breached is of 1/100. According to wise-uranium, on average two dams break per year, taking into account the data from 1961-2019, and their frequency seems to have an upward trend in recent years. The maximum number of dams that failed are recorded in 1965 and 1994, and 2019 is also a reference year with 6 such recorded events. Romania is also subject of such events, 3 events being recently documented, that had a strong impact on the population, economy and ecosystem of the affected areas (Certej, Baia Mare and Baia Borşa). The effects on the environment were major and the polluted waters came to affect the lower Danube basin, where the largest biosphere reserve in the Danube basin is also located. Tailing dams can be considered to contain wetted waste, which is produced during mining operations, the dams having the ability to limit the dimensional growth of depositional reservoirs. This kind of waste is formed, usually, from fine toxic dust. At the national level, there are about 100 tailings ponds. There is a high-density in the area of the Western Carpathians and the Northern Group of the Eastern Carpathians. Of these, a number of dams have been unstable in

recent years and are at risk of slipping, especially in periods of heavy rainfall. At many tailings ponds, safety and greening work has begun, but the work is often temporarily interrupted.

## **CHARACTERIZATION OF ORGANIC MATTER UNDER DIFFERENT SOIL TYPES AND USES WITH FTIR SPECTROSCOPY**

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FTIR spectroscopy offers a wide range of analytical opportunities, from simple identification of compounds to processing and monitoring, with FTIR covering a wide range of chemical applications, especially for organic compounds. Soil organic matter is a heterogeneous material consisting of different functional groups depending on the parent material, climate, geological substrate, soil texture. Differences in absorbance intensity for several spectral bands indicated a higher abundance of relatively fresh residues, phenolic-OH compounds, aliphatic compounds and carbohydrates agricultural soils compared to the higher presence of amide groups and aromatic bonds C = C links, carboxylic acids and their salts in forest soils occupied by deciduous, mixed or coniferous vegetation. The paper aims to characterize the organic matter in the North-East region of Romania by different types of uses and different types of soil from the first 0-15 cm. From the analysis performed on the samples it was observed that all FTIR spectra show distinct peaks and to different intensities in the following ranges: 3694 and 3617 cm<sup>-1</sup> originated from the stretching of O–H groups of clay minerals and they are mainly influenced by the clay content, 2920-2850 cm<sup>-1</sup> aliphatic C-H, 1633 cm<sup>-1</sup> C=C/C=O, 1417 cm<sup>-1</sup> aliphatic C-H, carbonates. In general, absorbance of functional groups was comparable among different soil types but they differed in absorbance intensity. In summary, it is possible to assess and compare SOM composition in different soil types with FTIR spectroscopy, although eliminating inorganic material from soil will provide more accurate results.

## **SURFACE WATER QUALITY ANALYSIS IN SUCEAVA COUNTY**

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The quality of water in rivers and lakes is a topic of great global interest due to its impact on people's lives. In the conditions of an increasing need for water, knowing the quality of surface water resources in Suceava County is a current topic. The main purpose of this study is to assess the quality of surface water in Suceava County. For this we analyzed the following physico-chemical indicators: ammonium, nitrites, nitrates, phosphates, dissolved oxygen, chemical oxygen consumption and dry filterable residue at 105°C determined after analyzing the water samples collected by the Suceava Water Management Service from Siret, Suceava, Moldova and Bistrița rivers, from their tributaries (Băișescu, Bârnărel, Brodina, Dorna, Falcău, Humor, Neagra, Pozen, Solca, Suha, Șomuzul Mare, Voitinel and Voroneț) and from Bucecea and Rogojești lakes, in 2008-2021 period. Following this evaluation, we found that in Suceava County the quality of surface water is mostly good, excepting Suceava River, in the Tișăuți section, where the water quality is moderate, the Pozen River, in the Satu - Mare section and the Șomuzu Mare River, in the Dolhești section with a poor ecological status.

## **FACETS OF ECOTOURISM. DYSTOPIAN TRAVELS IN ECOTOPIAN REALMS**

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In an attempt to underline the efforts to preserve biodiversity while still taking advantage of financially lucrative uses of the wild, the present paper functions as an inquiry into the complex dynamics of ecotourism, as an integral part of a pragmatic philosophy shaped by sustainable development. The equation people - environment generates puzzling results when it comes to actually applying the principles of biocentrism within an essentially anthropocentric, consumerist worldview, and there is always a thin line between genuine ecotourism and a photogenic, media-friendly simulation of it.

## **INDOOR MICROCLIMATE MONITORING IN A MUSEUM ENVIRONMENT. CASE STUDY OF "PONI CERNĂTESCU" MUSEUM FROM IAȘI CITY**

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This study includes a summary of air temperature and relative humidity values that characterize the indoor climate of the "Poni-Cernatescu" Museum in Iași, Romania, over a two-year period. This study presents the evolution of two internal microclimate parameters, air temperature and relative humidity, as well as their correlation with external climate factors, using charts and tabular data. The goal of this study was to describe the museum microclimate as well as to identify and analyze the degradation risk of museum artifacts in order to investigate the impact of hygrothermal indoor and outdoor loads on indoor microclimate parameters. To achieve the goal, the following activities were conducted: data collection on the relative humidity and temperature of indoor and outdoor air; data analysis using climate analysis tools and statistical methods; and data transformation into quantitative and qualitative numerical measures of collection decay risks. We were able to accurately describe the indoor climate conditions of the analyzed building thanks to the data we collected. The assessment's main conclusions were that the May–July period represented the period with the highest degradation risk for all types of cultural assets (wood, leather, photos, and paintings); this occurred due to a combination of high amounts of water vapor and high air temperature conditions. The museum's structural and functional parameters, as well as the operating levels of the heating and air conditioning systems, the arrangement, load, and typological complexity of the artifacts displayed, were all taken into account. We were able to develop useful recommendations based on the results to stabilize the climate conditions inside the museum. Specific mitigation measures for the negative effects of the analyzed environmental factors are proposed. The results show that favorable conditions for mycelium growth occurred in the basement. The physicochemical factors that characterize the museum microclimate have an impact on cultural artifacts. To describe the environmental space and explain the type of deterioration of cultural artifacts, indices that analyze the environment for the preservation of cultural goods in museums were calculated in this study. The study provided a climate-induced risk assessment for the preservation of cultural artifacts in the "Poni-

Cernatescu" Museum based on chemical, biological, and mechanical risks. Due to high relative humidity values, it was discovered that the climate conditions in the Basement were conducive to mold development during the summer months.

## **THE GREEN SHADES OF BLACK METAL. MUSICAL VECTORS OF ENVIRONMENTALISM IN A POSTMODERN SOCIETY**

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The present paper focuses on essential case-studies reflecting the entanglements between the often misunderstood metal music, the often neglected scientific community and the often indifferent contemporary society, against the background of an arguably postmodern layout of today's perceived reality. In order to be included in the social construction of nature, the environmental discourse resorts to a wide variety of approaches; among them, the one designed by the metal scene is becoming increasingly prominent, coherent and adaptable.

## **SEVERAL ASPECTS REGARDING THE VARIATION AND FREQUENCY OF SOME SPECIFIC PARAMETERS AND INDICATORS RELATING TO MINIMUM AIR TEMPERATURES IN BAIJA MARE CITY**

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Baia Mare city is the residence of the Maramureş County, one of the most well-known places in Romania for its natural beauties. It is located in the north-western part of Romania and therefore has some unique climatic characteristics, especially in the cold season of the year. The frequent Scandinavian-Baltic advections often generate thermal inversions producing low minimum air-temperatures, though not as low as compared to other depression areas in the country.

The main objective of this study is to provide a more detailed outlook on minimum air-temperatures, highlighting their extreme values, by analyzing different indices of extremes and climate change (ETCCDI), approved by the World Meteorological Organization (WMO). In this respect, based on

the climatic data provided by the Baia Mare weather station (over the 1980-2015 period), part of Romania's National Meteorological Administration (NMA) network, several specific indices have been calculated: number of frost days – FD, maximum number of consecutive frost days – CFD, number of intervals with cold waves – CSDI, number of days with minimum daily temperatures equal or lower than 10 percentiles – TN10p, heating degree-days related to minimum temperatures less than 0°C – HDDn0, respectively less than 10°C – HDDn10. In general, the synoptic context most favorable for the occurrence of lowest minimum air temperatures in this area is given by the presence of an extensive anticyclone producing intense radiative cooling and strong thermal inversions. This accounts for extreme minimum thermal values, although more attenuated than in other depressions in Romania (for example, Ciuc or Braşov).

By summarizing some relevant aspects in this regard, the following findings should be mentioned: the lowest minimum air temperature that has ever been recorded over the above mentioned period in Baia Mare was -24°C (on 31th January 1987); the average of minimum air-temperatures maintained at 5.6°C and the highest number of consecutive frost days reached as high as 54 (less than two months, in 1982). In addition, four cold waves occurred in 1990, 1992 and 2002, but no single cold wave occurred in 1988 and 2014. The HDDn0 index reached its highest value in 1985 (789.9°C) and two years after, a value of 729.6°C was reached, whereas the lowest values were calculated in 2014 (155.2°C). All minimum air-temperature parameters and indices show a large variation from one month to another and from one year to another, despite their pretty high frequencies. The late statement is also confirmed by the HDDn10 index, which reached a record value of 2612.2°C (in 1985) and a minimum value of 1586°C (in 2014).

The practical importance of all these quantitative assessments is the fact that they can be useful tools in calculating the energy consumption that would be needed either for heating homes in winter or for ventilating them in summer, within this city area, to ensure optimal bioclimatic comfort for the population and for forecasting the energy demands for domestic purposes.

Key words: minimum air temperatures, specific indices of extremes, Baia Mare city, Romania.

# **SPATIAL DISTRIBUTION AND TEMPORAL ANALYSIS OF THE MEAN TEMPERATURE OF THE WETTEST AND DRIEST QUARTER ON REPUBLIC OF MOLDOVA' S TERRITORY**

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Mean temperature of the wettest quarter (BIO8) and mean temperature of the driest quarter (BIO9) are one of the statistical bioclimatic indexes that characterize temperature's variability and are used in study of living organisms' responses to climatic changes. The article presents regional cartographic models for BIO8 and BIO9 and their temporal analysis for the 1960-1990 and 1991 - 2020. Although two meteorological stations, Soroca and Camenca, both situated at North-Eastern part of Moldova, within the higher parts of Dniester river's basin and on the significantly fragmented relief, had demonstrated the decline in average values of BIO8 and BIO9 during the contemporary period (1991-2020) when compared with the reference period (1960-1990), when we analyse the trends of multiyear data, and compare it with the other stations, most of which show increase in average values of BIO8 and BIO9, we conclude that still all the meteorological stations, although with some variations, demonstrate the same pattern: an increasing trend during the reference period and a sideways or decreasing one during the contemporary period. We were also able to obtain regression models for BIO8 and BIO9 with a considerably low mean absolute error and relatively high R<sup>2</sup>. The maps of the spatial distribution were executed in ArcGIS 9.2, Spatial Analyst package, Map Algebra, based on the above-mentioned models.

## **URBAN ECOLOGICAL RESTORATION IN A POST-INDUSTRIAL CONTEXT: THE CONTRIBUTION OF ECOSYSTEM SERVICES IN THE PROCESS OF REVITALIZING SMALL MONO-INDUSTRIAL CITIES**

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The integrity of ecosystems is absolutely essential for human well-being, as they ensure, through ecosystem services, the necessary conditions for a qualitative living. Consequently, maintaining a balance between human activities and natural processes should be one of the main objectives of

urban planning. The importance of maintaining this balance has also become a priority in the global discourse on the role of the economy, which is gradually shifting towards a new system of values and objectives aiming at solving the pressing social and ecological issues and ensuring the well-being of the population (Lorek, 2013).

Industrial cities are a relevant example for demonstrating the interdependent relationship between human activities and the quality of environmental factors. They illustrate both the magnitude of the anthropogenic impact on ecological functions and processes, and the reverse phenomenon of inhibiting socio-economic development due to the state of environmental factors. At the same time, these cities are unable to revitalize themselves with their own resources. On this issue, the article discusses the potential of intercommunalism as an effective method of recovery through cooperation, by providing joint services and solving administrative fragmentation, the lack of resources, the difficulty of accessing funds or the lack of specialized staff that could attract funding.

The paper aims to explore the extent to which former small mono-industrial cities in Romania can be revitalized and regain a set of relevant urban functions by economic correlation of larger areas and by providing specialized and complementary services to support new trends in the economy. In particular, the article will explore the need to stimulate a special category of services as a result of urban ecological reconstruction: ecosystem services, which play a key role in the process of "healing" and restoring the attractiveness of these cities and contribute substantially to restoring a stable balance between man and nature.

## **PARTICULARITĂȚILE UTILIZĂRII RESURSELOR DE APĂ ÎN DISTRICTUL BAZINULUI HIDROGRAFIC NISTRU (sectorul Republicii Moldova)**

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Districtul Bazinului Hidrografic (DBH) Nistru ocupă  $\approx 58\%$  din suprafața totală,  $70\%$  din efectivul total al populației prezente și  $97\%$  din volumul total de ape utilizate în Republica Moldova. Conform datelor Agenției „Apele Moldovei”, în perioada analizată (2003-2020), volumul total de ape utilizate în DBH Nistru a fost, în medie, de  $759 \text{ mil. m}^3$ , inclusiv  $670 \text{ mil. m}^3$  ( $88\%$ ) în Regiunea Transnistreană și  $89,1 \text{ mil. m}^3$  ( $12\%$ ) în partea

dreaptă a Nistrului, din care 50,1 mil. m<sup>3</sup> (57%) în municipiul Chișinău și 22,8 mil. m<sup>3</sup> (26%) – în raioanele riverane.

Peste 70% (552 mil. m<sup>3</sup>) din volumul total de apă utilizată în DH Nistru provine din lacul de acumulare Cuciurgani, fiind folosită la răcirea agregatelor tehnologice ale CET Dnestrosc situată în Transnistria. Din albia fluviului Nistru au fost utilizate, în medie, 163 mil. m<sup>3</sup> sau doar 22% din volumul total de apă folosite în DH Nistru.

Din surse de suprafață au fost utilizate, în medie, 664 mil. m<sup>3</sup> (87%), iar din surse subterane – 94,3 mil. m<sup>3</sup>. În scopuri tehnologice au fost utilizate, în medie, 580 mil. m<sup>3</sup> sau peste  $\frac{3}{4}$  (76%) din volumul total al apei utilizate, în scopuri menajere – 111 mil. m<sup>3</sup> (15%), iar în scopuri agricole – doar 66,1 mil. m<sup>3</sup> (8,7%), inclusiv pentru irigare – 41,1 mil. m<sup>3</sup> (5,4%). De asemenea, peste 60% din apa provenită din albia fluviului Nistru este utilizată în scopuri menajere pentru aprovizionarea cu apă a municipiilor Chișinău și Bălți. În Regiunea Transnistreană, în scopuri tehnologice au fost utilizate, în medie, 568 mil. m<sup>3</sup> de apă sau 85% din volumul total, în scopuri menajere – 60,1 mil. m<sup>3</sup> (9%), iar în scopuri agricole – 39,6 mil. m<sup>3</sup> (6%), inclusiv 32,8 mil. m<sup>3</sup> (5%) pentru irigare. În partea dreaptă a DBH Nistru, în scopuri menajere au fost utilizate, în medie, 50,7 mil. m<sup>3</sup> sau 57% din volumul total de ape utilizate. Acest fapt este condiționat de prezența municipiilor Chișinău și Bălți. În agricultură au fost utilizate, în medie, 26,5 mil. m<sup>3</sup> de apă (30%), inclusiv pentru irigare 8,4 mil. m<sup>3</sup> (10%), iar în scopuri industriale – 11,7 mil. m<sup>3</sup> (13%).

În anii 2003-2020, volumul total de ape utilizate, înregistrează o evoluție oscilantă, cauzată atât de mersul anual al precipitațiilor atmosferice și de evoluția demografică și economică, cât și de datele din partea stângă a Nistrului, care sunt aproape constante în perioada respectivă. Per ansamblu, în anii 2003-2019, se observă o dinamică negativă slab pronunțată, iar valorile din anul 2020 sunt aproape egale cu cele din anul 2003. Valorile maxime din anii 2007 și 2020, se datorează consumului maxim de apă în condițiile secetelor mai puternice și mai îndelungate în acești ani. În partea dreaptă a DBH Nistru, evoluția oscilantă este deosebit de pronunțată. În anii 2003-2007 se înregistrează o dinamică pozitivă (de 1,2 ori), cauzată atât de relansarea economică și demografică în perioada respectivă, cât și de cererea mare pentru apă în anul 2007 mai secetos. În anii 2008-2016, se manifestă o tendință negativă accentuată, iar volumul total de ape utilizate s-a redus de peste 1,4 ori sau cu 23,1 mil. m<sup>3</sup>, fapt ce se datorează instabilității social-economice în perioada respectivă, falimentării și reorganizării întreprinderilor agricole mari și Stațiilor Tehnologice de Irigare, declinului efectivului populației, răspândirii tehnologiilor cu pierderi mai mici de apă, dar și curențelor evidenței statistice în acest

domeniu. În anii 2017-2020, se atestă o majorare a volumului total de ape utilizate, inclusiv în bazinele afluenților principali – Răut, Bâc și Botna.

**THE IMPACT OF THE MINING INDUSTRY ON THE  
ENVIRONMENT IN THE NORTHERN DEVELOPMENT  
REGION OF THE REPUBLIC OF MOLDOVA**

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Useful mineral deposits comprise three groups: combustible, metalliferous, nonmetalliferous. The first two groups exist in very small quantities and their role in the sustainable development of the region is minimal. Of interest for sustainable development is the group of non-metals that are made up of different rocks as building materials. Depending on the provision of the population with resources of useful mineral substances of the Northern Development Region, the districts of Soroca, Rascani, Edinet and Floresti are highlighted. The deposits (quarries and mines) of clays, sandy and clayey clays, construction sands and pebbles, limestone and crude limestone, sandstone, gypsum and tripoli are taken to the current record. The number of exploitations of useful mineral substances exists in 8 of the 12 administrative-territorial units, with some concentrations in Soroca and Rascani districts. RD Nord takes precedence over the size of the areas of the limestone mining companies and the areas of the mining operations in operation. At the same time, better quality deposits are extracted, lower quality deposits are neglected. Over the last few decades, huge volumes of production waste have accumulated. In sandstone quarries, the volume of production waste is lower because the extracted material is used almost entirely. Certain environmental problems create the large volume of rubble (limestone flour) accumulated near the quarry. As a result of mining, there is a change in the use of cultivated land, pastures, areas occupied by perennial crops, those covered with forest vegetation by reducing their areas.

## **INDICES OF EXTREME RAINFALL INTENSITIES AT SUB-HOURLY TEMPORAL SCALE IN DOBROGEA, ROMANIA**

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This study actually presents a statistical analysis of maximum precipitation amounts at different time intervals in Dobrogea historical region, spanning over the whole historical period of measurements available for each meteorological station taken into consideration. The data provided by the National Meteorological Administration have different time spans for each weather station, starting with 1948 (at Constanța weather station). Two methodologies were used for data recording: the pluviographs during the last century, and the automatic weather sensors, which have been more recently introduced into general use, respectively. In this study, a sub-hourly temporal scale was used to estimate extreme rainfalls: 5, 10, 15, 20, 25, 30 minutes. Then, the corresponding evolution trends were calculated over the entire period of reference, with the Mann-Kendall Test being applied to estimate their statistical significance. The probability for extremely high precipitation amounts to occur in very short periods of time and consequently, the resulting rainfall intensities have also been computed by means of the Generalized Extreme Value distribution. The findings show that, despite the general scarcity of rainfall amounts, mostly due to prevalent mid-latitude semi-arid conditions (the annual rainfall amounts in Dobrogea hardly exceeding 400 mm/year), when occurring, they are very heavy, mounting up to 20 mm in 5 minutes.

## **ASSESSING BARE SANDS AREAS FROM SOUTH ROMANIA, THROUGH A NEW REMOTE SENSING INDEX: SAND INDEX NORMALISED**

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In this study, the evolution of bare sand surfaces from Oltenia was evaluated based on a new remote sensing index Sand Index Normalized

(SIN) calculated on Landsat images, from 1988, 2001 and 2019, and later validated by soil sample analysis.

The existence of areas with bare sand is influenced by the land use and the variability of climatic conditions. Land improvement works performed during the planned agriculture period, have reduced wind erosion in some areas, but have also favored the maintenance of bare sandy areas in other places. After 1989, the reduction of irrigated areas, the abandonment of sandy soils specific crops and the decrease of forested areas, increased the areas with bare sand. Sandy areas are increasing in 2019, but at a slower pace due to national reforestation programs and the revegetation of agricultural land.

SIN accurately emphasises sandy areas, but is limited in performance in transitional area to Chernozems due to humus and agrotechnical content, being optimal for temperate sandy soils.

## **CHANGES IN NUMBER OF SNOW COVER DAYS OVER ROMANIA IN THE LAST 60 YEARS**

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Seasonal snow is an essential water resource in many mountains regions. Accurate snow depth observations are critical to assess water resources. Daily snow depth (SD) around 114 stations are used to analyse variations in snow cover days characteristics in Romania's territory. This study investigates whenever these changes depend on elevation, underlying regional climatic features. Thus, the trends in snow cover days are analysed by using the non-parametric Man-Kendall test in trend detection. The Theil-Sen's slope was also used to estimate the trend slope, expressing the magnitude (rate) of observed changes as days decade<sup>-1</sup>. Trend analysis was performed for each individual station within the boundaries of each climate region and each climate region and 500 m elevation band, to detect subsequent changes (increasing or decreasing), possible elevation dependencies and to capture country-wide spatial distribution patterns of change. Additionally, vertical profiles of trend slopes for each snow cover phenology parameter using a 100 m step were also used for evidence of elevation dependency across each climate region of the country. The results

provide further evidence of a declining snow cover regime, with slight differentiations induced by the elevation. About 59% of stations experience significant ( $p < 0.05$ ) declines. The country-wide average change is  $\sim 0.33$  days/decade, with a slightly higher decrease in the lowlands (with a maximum of  $\sim 0.74$  days decade<sup>-1</sup>) than in the highlands  $\sim 0.25$  days decade<sup>-1</sup>).

## **ACCESIBILITATEA LA LOCURI DE JOACĂ PENTRU COPII ÎNTRE (IN)ECHITATE SPAȚIALĂ ȘI VULNERABILITATE SOCIALĂ. ANALIZĂ COMPARATIVĂ: MUNICIPIILE IAȘI ȘI BACĂU**

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În strânsă legătură cu spațiile verzi și, în general, cu ariile de recreere, analiza locurilor de joacă pentru copii din intravilanul orașelor, reprezintă o tematică importantă și actuală pentru geografia urbană, socială și culturală, dar și pentru geografia mediului sau planificarea teritorială. Copiii reprezintă, oarecum paradoxal, o categorie socială deseori neglijată și chiar marginalizată iar problematica planificării urbane le este rareori dedicată în mod explicit. Scopul cercetării de față este realizarea unui studiu integrat referitor la calitatea și accesibilitatea populației din orașele Iași și Bacău la spațiile de joacă pentru copiii (SJC). Multe apărute recent, în interiorul sau în apropierea unităților de învățământ, în cadrul parcurilor preexistente sau, independent, în cartiere rezidențiale, inclusiv în cele noi, SJC reprezintă spații publice ale interacțiunii umane, ale mișcării și recreerii. Evaluarea noastră se referă cu precădere la SJC publice din incinta marilor habitate colective cu acces liber, analiza referindu-se la situația actuală a distribuției spațiale a acestora, a accesibilității populației la aceste servicii, a calității infrastructurii corespunzătoare și a atractivității lor în cadrul organismului urban. Este un studiu comparativ și exploratoriu care pune în paralel două dintre orașele importante ale Regiunii Nord-Est a României vizând o explorare empirică a situației de pe teren și realizând, în prima etapă, un inventar, care în prezent lipsește într-o variantă completă și actualizată, la primăriile celor două municipii. Analiza spațială realizată cu instrumente SIG arată ariile situate favorabil și pe cele periferice în raport cu aceste utilități urbane. Calculul distanței-timp spre SJC pune în evidență

ariile cu o slabă acoperire și unde accesul la un loc de joacă presupune o deplasare foarte lungă. Rezultatele sunt puse în relație cu structura demografică a cartierelor celor două orașe și cu necesitățile legate de prezența unor contingente semnificative de familii cu copii. Complementar, analizăm și problematica locurilor de joacă din incinta grădinițelor și școlilor la care nu au acces toți copiii, ci doar cei arondați acestor instituții. Studii de caz punctuale complează și aprofundează analiza iar, în final, secțiunea dedicată discuțiilor și concluziilor, introduce chestiuni privind rolul în plan social/comunitar al acestor spații și atrage atenția asupra problemelor, dar și a oportunităților completării și creșterii calității acestei infrastructuri esențiale unor orașe echitabile, locuibile și durabile.

## **CALITATEA APEI, SURSE DE POLUARE ȘI MĂSURI DE PROTECȚIE**

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În procesul unei dezvoltări durabile, atât la nivel național, cât și internațional, problema gospodăriei raționale a resurselor de apă ocupă un loc important, ținându-se cont că apa a devenit unul din factorii limitativi în dezvoltarea socio-umană. Asigurarea populației cu apă potabilă constituie unul din factorii primordiali ai securității naționale a țării. De calitatea și cantitatea apei, depinde starea sănătății și nivelul sanitaro-epidemiologic al populației. Scopul lucrării este determinarea calității apei potabile, sursele de poluare și propunerea măsurilor de protecție. Efectuând analiza chimică a apei din fântâni în cadrul Laboratorului de Ecourbanistică a Institutului de Ecologie și Geografie al Academiei de Științe și Agenția Națională de Sănătate Publică, orașul Ungheni s-au obținut rezultate ce nu corespund normelor standard. Indicii alcalinității, durezzații, reziduul fix, concentrația de amoniu depășesc norma, iar indicii pH-ului; concentrația de nitrați; concentrația de clor și sulfati corespunde normei. Aceasta duce la dereglarea metabolismului, la formarea calculilor cu declanșarea treptată a patologiilor organismului. Apa fântânilor studiate este foarte dură, indicii fiind peste 14 mg/dm<sup>3</sup>. Durezzații apei cu concentrații mai mari de 12 mg/dm<sup>3</sup> înlesnește apariția osteoartrozelor, osteopatiilor, renolitiazelor, colelitiazelor. În cazul depășirii concentrației medii admisibile la indicii ce determină mineralizarea (calciu, natriu, magneziu, hidrogenocarbonați), în sânge crește nivelul glucozei, al acidului uric. Durezzații apei favorizează

dizolvarea în apă a unui șir de metale: cadmiu, cobalt, nichel, crom, mangan care, la rândul lor, au o acțiune toxică asupra sistemului cardiovascular. Rezultatele investigațiilor au relevat că apa din fântâni, comparativ cu cea arteziană, se caracterizează printr-un grad înalt de mineralizare și o duritate înaltă. Nu duritatea în sine este benefică, ci Ca, Mg ai căror compuși sunt factorul major determinant al durității. Au un efect favorabil al Ca, Mg, Cr, Mn și Zn; în schimb, Na, Cu și Co sunt suspectate pentru efecte defavorabile. Concentrația nitraților ( $\text{NO}_3^-$ ) în apa potabilă peste limitele admisibile constituie o problemă majoră. Limita maximal admisibilă de nitrați în apă nu trebuie să depășească  $45 \text{ mg/dm}^3$ . În urma studiului am constatat că nivelul ridicat al nitraților și nitriților în apa din fântâni se află la originea unor dereglări acute ale sănătății populației și anume poate duce la intoxicație cu nitrați. În Moldova cel mai frecvent întâlnite și cunoscute substanțe toxice din apă sunt nitrații. Consumul unor cantități mari cu nitrați poate provoca methemoglobinemia. Declanșarea maladiei are la bază transformarea nitraților în nitriți, aceștia din urmă fiind implicați în producerea bolii. Nitriții se combină cu hemoglobina, transformând-o în methemoglobină ce blochează transportul oxigenului în țesuturi. Astfel, hemoglobina își pierde funcția de a lega și transporta oxigenul producând hipoxie. S-a constatat, că consumul apei cu nitrați afectează dezvoltarea biologică generală a copiilor, provocând intoxicații cronice, care nu au manifestări clinice evidente. În urma contaminării apei fântânilor cu diverși poluanți, acțiunea acestora este complexă și se manifestă: asupra ficatului, sistemului nervos, a unor glande endocrine, unor enzime. La fel au acțiune cancerigenă și asupra descendenților. Compușii chimici de sinteză apar adesea în concentrații neadmisibile în apele de suprafață în cadrul proceselor de potabilizare, ajungând în rețelele de alimentare a populației.

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