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Natural Hazards
Links between Science and Practice

Book of Abstracts

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NATURAL HAZARDS – LINKS BETWEEN SCIENCE AND PRACTICE

BOOK OF ABSTRACTS

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ELECTRONIC LANDSCAPE MAP GIS AS A BASE FOR FORECASTING OF GEOECOLOGICAL PROCESSES

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Abstract: Landscape maps have been traditionally considered as a result of research. Now it is clear, that landscape map should be a starting point for the analysis of the natural geo-environmental and socio-productive systems, forecasting of natural and technogenic disasters, protection and planning of cultural landscapes. Synthetic electronic landscape map (ELM) of regional geographic system (GIS) based on Earth Remote Sensing Data, is a scientific model of Earth surface that reflects the genesis, development, functions, and dynamics of geosystems. Years of experience in the field of landscape studies in evaluation of geo-ecological situations forecasting of environmental emergencies and planning of cultural landscapes shows that these maps should reflect the spatial and temporal structure in addition to the morphological structure of technogenic landscapes and characteristics of geocomplexes properties. Development of ELM, that allows a complex of measures to optimize the functioning of the cultural landscape, unlimited editing of thematic layers, conjugate analysis of natural and man-made elements, simulation of geo-ecological situations is a perspective area of research. ELM is designed to incorporate the advantages of analytical and synthetic traditional landscape maps and become a core of the regional GIS. It should provide a synthesis of multi-level information, production of non-standard scientific concepts, justification of decisions in environmental management. Thus, ELM considerably exceeds the traditional landscape maps and incorporates the best properties of analytic and synthetic landscape mapping. On the basis of general scientific landscape map, series of geoenvironmental maps is developed: sustainability of natural systems, landscape and environmental (geo-environmental) potential, technological complexes and objects that affect the natural territorial complexes, anthropogenic landscape changes, the regulation of economic activity. Collection of landscape and ecological maps forms an electronic atlas of natural, social and manufacturing systems of the region that is used to predict anomalous (catastrophic) phenomena in landscapes.

Key words: landscape map, prediction of anomalous (catastrophic) phenomena in landscapes

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NATURE MANAGEMENT RISKS IN SIBERIA

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Abstract: The natural human environment is a source not only of resources for development, but also of a variety of hazards that can hamper this development. Abrupt climate changes, enormous consumption of natural resources, and pollution of the environment inevitably lead to an increase in the probability of making wrong decisions in various aspects of nature management. The paper considers five basic types of anthropogenic impacts on the Earth's ecosystem, namely: destruction of the biosphere, intensification of natural disasters, pollution of natural environments, depletion of natural resources, and land degradation. The features of Siberian nature that create special environmental situation conditions are shown. A scheme for studying the natural-anthropogenic risk at the regional level is suggested. Economic development of new territories in Siberia, including the development of oil and gas fields, and pipelines, power lines, and roads construction, leads to increased natural hazards. Knowledge of natural processes, assessment of hazard and risk of nature management, forecast of environmental hazards development, and proposals development to reduce the natural-anthropogenic risk is required.

Key words: nature management, risk, environmental pollution

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RECENT FOREST FIRES IN THE REPUBLIC OF SERBIA – TOWARDS CLASSIFICATION, LEGISLATION AND FIRE MANAGEMENT

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Abstract: In the era of climate change, predicting and analyzing future fire activity are scientific challenges that are very important for the development of sustainable forest management practices and policies. Forest fires happen frequently and the loss is very serious each year. In this paper we discuss the issues of recent forest fires in the Republic of Serbia towards classification, legislative framework and fire management. Also, statistical data on forest fires were analyzed by using Mann-Kendall test in order to estimate their occurrence and frequency. Additionally, meteorological data and fire statistics obtained from Republic Hydrometeorological Service of Serbia and Ministry of Interior / Sector for Emergency Management of the Republic of Serbia were used in order to calculate forest fire weather index for the case study of Tara Region. Year of 2012 was analyzed since it was the year with highest occurrence of forest fires in the recent period. All this emphasizes the importance of fire hazard investigation for the purpose of its prevention, mitigation and management.

Key words: forest fires, hazards, forest fire index, Tara, Serbia

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KARST RISK ASSESSMENT FOR ENGINEERING IN NIZHNY NOVGOROD REGION, RUSSIA

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Abstract: Federal Standards of the Russian Federation include the requirement of mandatory assessment of the risks induced by natural processes in order to make sure their values do not exceed acceptable limits. To meet the requirement a number of karst risk assessment methods have been developed for the regions of the country where the most significant hazard is presented by karst sinkholes. For this particular application karst risk is understood as specific probability of sinkhole development on a unit area per a unit time span with account of probable economic, social and environmental components of damage. The probability of sinkhole development is evaluated by specialists in engineering karstology and designers. They make use of the acceptable data on the environmental conditions and apply stochastic laws of sinkhole development in time and space, alongside with focusing on all other relevant specificity of a building or a facility to be built. Acceptable limits of karst risks should be specified by a multidisciplinary team including designers, lawyers, economists, insurers, environmentalists, engineering karstologists and other specialists on the basis of their expert knowledge. It has been demonstrated that a ratio between predicted and acceptable karst risk values can serve a practically meaningful karst risk level indicator for the purposes of building on karst. This ratio can be used with a rather high degree of objectiveness to develop a programme of antikarst activities during both facilities construction and operation.

Key words: karst, risk, sinkhole, antikarst protection

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EXAMINATION OF THE CORRELATIONS BETWEEN FOREST FIRES AND SOLAR ACTIVITY USING HURST INDEX

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Abstract: The aim of this paper is to find the functional dependence between the occurrence of forest fires and the factors inherent to solar activity. It has been shown that the amplitude of number of forest fires in the USA for warm period 2004-2007 is not time dependent. The method of seasonality indices for seasonal components filter was used for the decomposition of time series. In order to test this hypothesis the correlation analysis was held between the factors X_i and the number of fires taking into account time delay (lag) between the onset of fires and solar activity. The results of this analysis show that any correlation coefficient is not higher than 0.2. For determination of the degree of randomness for time series of input and output parameters, the R/S analysis was conducted. The Hurst index was used for determining the depth of their memory. Based on the proximity of the Hurst index for the 10.7 cm solar flux categories and small forest fires, a reasonable assumption can be made that the dynamics of these time series is heavily dependent on the same factors.

Key words: forest fires, solar activity, Hurst index, USA

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SAFETY AND RESILIENCY IN ACTION: INTEGRATING RISK MANAGEMENT INTO LOCAL DEVELOPMENT

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Abstract: This paper examines the efforts of the local government unit (LGU) of San Jose de Buenavista, in the Province of Antique in central Philippines to manage risks associated with multiple hazards to protect the people, their livelihoods and local development gains. More specifically, it analyzes the process of pursuing risk management objectives vis-a-vis national and international disaster risk reduction and management (DRRM) norms, without loosing sight of local contextual realities that directly influence people's vulnerabilities and capacities. Risk management initiatives in the LGU revolve around four key areas namely disaster prevention and mitigation, disaster preparedness, emergency response, and recovery and rehabilitation.Binding these initiatives are actions that integrate governance mechanisms with scientific data and sectoral and community participation to develop a comprehensive plan of action and standard operating procedures that will serve as guideposts in the process of building a safer community. The experience of San Jose de Buenavista also suggests that cost saving strategies an be replicated by communities and organizations that have financial limitations to pursue DRRM objectives. This paper contends that risk management is a fundamental development strategy to pursue local development goals and to sustain efforts to protect development gains in the long run. This can be done using a combination of governance, risk assessment, knowledge management, vulnerability reduction and preparedness strategies. Local leadership, people's participation,environmental resource management and continuous capability building are key elements of the process.Ultimately, risk management must be mainstreamed into local development to develop community resiliency.

Key words: risk management, local development, resiliency

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ASSESSMENT OF VULNERABILITY TO CLIMATE HAZARDS IN MUNICIPALITY OF LOM, BULGARIA

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Abstract: An important part of the natural hazard's risk management is the vulnerability assessment. There are many publications proposing different systems of indicators and tools for vulnerability assessment, but very few of them are dealing with the problem on community level. The study for municipality of Lom is carried out on the base of a framework for vulnerability assessment which includes the following important elements: hazard probability, exposure, sensitivity and coping capacity. In this paper we use the spatial dimensions of the areas prone to a particular climate hazard as an indicator for the level of exposure to this hazard. We introduce a measure for the system sensitivity as a function of hazard and exposure classes assigned to these areas. On the base of a system of indicators and scores for the hazard, exposure, sensitivity and capacity, is estimated a Vulnerability Index for municipality of Lom. The results from this case study show that implementation of the proposed Vulnerability Assessment Method provide reliable information for the level of vulnerability to ten climate hazards. It may be of use for different risk management purposes.

Key words: climate hazards, vulnerability index, vulnerability maps

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EXPERIENCE OF CREATING AN ATLAS OF HAZARDS AND EMERGENCIES IN THE RUSSIAN FEDERATION

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Abstract: The specialists of the Ministry of Emergency Situations of Russia together with scientists from the Russian Academy of Sciences conducted an analysis of possible crises and threats that are relevant to Russia at the beginning of the XXI century: natural hazards, man-made hazards, environmental risks, social risks, risks arising from the military operations, as well as terrorist threats. As the result an atlas of hazards and emergency situations in Russia was created, which allows the assessment of the risks and extent of emergencies in specific areas. The appearance of the atlas was preceded by the release of individual maps on the territory of Russia: the maps of fires, floods, earthquakes and other hazards. In Russia in the natural area the most dangerous are floods, hurricanes, typhoons, storms, earthquakes and droughts; in the man-made area – large fires , accidents at potentially hazardous facilities and electric power systems. The situation is complicated by the significant depreciation of productive assets and a reduction of the technological discipline in large industrial plants.

Key words: atlas, emergencies, natural hazards, Baikal nature territory

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ANALYSIS/FORECAST OF A SEVERE METEOROLOGICAL EVENT

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Abstract: A case of a very severe storm in Serbia that occurred on 22 June 2013 has been selected. An analysis of the relevant synoptic maps and aerologic products was performed. Data and products from the Deutscher Wetterdienst (DWD) and the Republic Hydrometeorological Service of Serbia (RHMSS) were used in the analysis. The non-hydrostatic mesoscale numerical model (NMM) and ECMWF products were used to produce the forecast. The aim of this paper is to present a meteorological disaster with massive hail that hit a part of Serbia in the evening of 22 June 2013, and which, according to its characteristics, can be classified as an extraordinary and dangerous meteorological event. The diagnosis of the cloud system during the meteorological disaster was performed through an overview of satellite images, electrical discharges and radar images.

Key words: hailstorm, cumulonimbus clouds, synoptic analysis, the non-hydrostatic mesoscale numerical model

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ANALYSIS AND PROJECTION OF SUMMER TEMPERATURE REGIME IN BELGRADE

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Abstract: Weather is presented by multitude of meteorological parameters and continuously oscillates around the average climate values. Although patterns repeat after a certain period, nevertheless they virtually are never identical with preceding cases. They have different intensity, duration and consequence. However, some lawfulness of repetitiveness of patterns and meteorological parameters were observed and they can be described and defined by the indices of circulation. In this paper we analyze the repetitiveness of hot and cold summers in Belgrade, which are defined by temperature and number of days with maximum temperature above a certain value. The analysis is focused on a very hot summer, which poses a potential threat due to rainfall and drought deficit, and favorable conditions for forest fires. By spectral and graphical method we observed lawfulness of their repetitiveness and on the base of that we made projections of temperature regime. The result indicates that in the next 30-35 years the number of days with the maximum daily temperature equal to or greater than 35°C decreases and in the equally long time again increases. Because the temperature correlates with the number of days with the maximum daily temperature, the average summer temperature should have an oscillation of about 65 years like trend of the number of days.

Key words: warm summers, repetitiveness, number of days with tmax=>35°C

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PHENOMENON OF TORRENTIAL FLOODS AS NATURAL HAZARDS IN SERBIA: PRELIMINARY RESULTS OF TORRENTIAL FLOODS DATA COLLECTION

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Abstract: Torrential floods or flash floods are the sort of water related natural hazards with sudden occurrence of maximal discharges and a high concentration of hard phase. Torrential floods are always followed by severe material damages and often casualties which is the reason for proclamation of emergency situation. This phenomenon is conditioned by intensive rainfalls which have a rapid response in torrential watersheds of small area, steep slopes and high soil erosion intensity. Their appearance is sudden, duration is short and consequences are destructive. In our database over 12 000 torrents, 427 destructive torrential flood events and over 112 casualties are registered for the period of last 99 years in Serbia. Distribution of torrential flood events per months clearly shows peak in May and June, followed by March and February which corresponds to earlier research in torrential flood frequency within year. This paper gives the spatial and temporal characterisation of torrential flood phenomenon in Serbia.

Key words: torrential flood, frequency, risk management, consequences

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WAYS TO IMPROVE OBJECTS RECOGNITION AND CLASSIFICATION IN SATELLITE IMAGES

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Abstract: Based on GIS (geographical information system) data it is possible to predict fires behavior and their consequences, which in its turn allows planning of activities within certain areas and period of forest fires season to prevent ignition of forest plots and eliminate the fire effects.
The article analyzes modern technologies and methods to improve the efficiency of object recognition in satellite images, in particular the method of multispectral satellite high-resolution scans and their interpretation in a geographical information system (GIS). Using multispectral images can improve the efficiency of objects recognition and classification. However, at a sufficiently high spectral resolution there is a problem related to the necessity of characteristics (spectral signatures) processing in high-dimensional spaces. The solution to this problem lies in the fact that first it is reasonable to reduce the space dimension and to perform recognition (classification) in the new space. Increasing of the separation ability resolves two interrelated objectives: improving of the visual quality and images reconstruction. Solution of the first problem is the method of fragmentation and zoning images. The solution of the second one is the deconvolution method. The combination of area images processing and their reconstruction allow approaching solution of fire prediction problem and selection of distinguishing methods.

Key words: satellite remote sensing, operator activity, multispectral satellite images operative monitoring

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MAPPING SOIL EROSION SUSCEPTIBILITY USING GIS TECHNIQUES WITHIN THE DANUBE FLOODPLAIN, THE CALAFAT - TURNU MĂGURELE SECTOR (ROMANIA)

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Abstract: The Danube floodplain, the Calafat – Turnu Măgurele sector, through its main features (topographic and climatic characteristics, land use and soil type) and human activities, constitutes an area exposed to soil erosion. The main objective of the present research is to map soil erosion susceptibility using the GIS techniques for the computation and representation of areas, which are exposed to soil erosion correlated with the field data for the validation. Analyzing the entire model, the relatively simple methodology, the database consistence, the comparability of the results with the existent soil erosion values at national and local scale, we can say that the model was applied with success in the studied area (areas and classes of water erosion susceptibility: very low, low, moderate, high - Ciupercenii Noi, Desa, Măceşu de Jos, Grojdibodu, Orlea, very high - Rast, Negoi, Catane, Bistreţ, Goicea; areas and classes of wind erosion susceptibility: very low, low, moderate - Ciupercenii Noi, Dăbuleni, Ianca, high - Calafat, Poiana Mare, Desa, Goicea, Piscu Vechi, very high - Poiana Mare, Rast, Negoi, Bistreţ, Gighera, Orlea. The soil erosion susceptibility map can be useful for planning erosion control measures and for selecting suitable sites for runoff plot experiments.

Key words: the Danube floodplain, soil, water erosion, wind erosion, database, GIS analysis, susceptibility

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SPECIAL SOFTWARE FOR ARIDITY INDICES CALCULATION (AICS); VOJVODINA, SERBIA CASE STUDY

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Abstract: Knowledge of aridity is necessary to explain the characteristics of the geographical landscape. Increasing aridity due to global warming can be a real hazard, with the threat of desertification. The main aim of this paper is to introduce special software for aridity indices calculation (AICS), and on the basis of those data to peruse aridity as a natural hazard. These indices were calculated from data obtained from 10 meteorological stations in the Vojvodina region for the period from 1949 to 2006. In order to calculate the De Martonne aridity index, I_{DM}, and the Pinna combinative index, I_P, software was created using C# programming language. Not only that this software shows the values of indices, but also it shows to which class it belongs according to the De Martonne climate classification. Graphical presentation of both calculated indices is also enabled. Further development of AICS is planned. As additional software package here was used ArcMap 10.1 for the spatial representation and visualization of the aridity indices.

Key words: aridity, hazard, software, Vojvodina region, Serbia

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GOAL-SETTING AND NATURAL CATACLYSMS

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Abstract: It is possible to claim that emergence of natural cataclysms is closely connected with a goal-setting in social systems. The person is distinguished from fauna by ability to a goal-setting: activity of people is based not on the instincts put by the nature, and on statement of the new purposes, development of tasks and ways of their achievement. Therefore the internal logic of development of human society can't be understood only on the basis of a postulate on aspiration to a survival and a reproduction. From positions of purposes the principle of functioning of social system quite often formulate as aspiration to a certain ideal. But the way to an ideal - not in advance known movement because an ideal is mobile. He acts as the reason of structuring difficult objects, as reason crises and chaos approach. This "paradox" – manifestation of the all-planetary law of development of everything that lives on Earth: order through chaos. The highest system reason of emergence of natural cataclysms is the negative goal-setting in social systems. Efforts for on achievement of the negative purpose is the way of fight, conflict development, finally – destructions. The author proved the preference of the positive purposes having the general character (the Law of positive dynamics of the Universe opened and proved by the author is registered by the International registration chamber of information and intellectual novelty, registration number No. 000379, 24 of March, 1999). This preference means that the Universe doesn't possess symmetry, and has the vector of "preferable" development. This vector is connected with preference and a bigger community of the positive purposes. As under the proved law Universe has positive commitment, decrease in entropy can be reached only by the processes realizing the positive purposes. Thus, the positive goal-setting can serve as the methodological instrument of prevention of natural cataclysms.

Key words: goal-setting, positive purposes, law of positive dynamics of the Universe

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HYPERBOLIC RANK PARAMETERIZATION OF COMPLEX HIERARCHIC STRUCTURES IN RISK AND HAZARD ASSESSMENT

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Abstract: The rank in the systematics is a level in a hierarchically organized set of elements. Rank distributions are used for analyzing complex multi-componential systems of entirely different nature: social systems (table of ranks), systems of living organisms (species, classes, orders, families), technocenoses (nomenclature of products), etc. The ranks in the systematics are regulated by the natural scale values that divide the system into components characterized by a certain status (income, distribution, price, energy consumption, etc.). Each rank accounts for a certain magnitude of elements or parameters, which permits speaking about the rank as a function of the specific status. In any system there are components comparatively few in number, but of high status, and there are comparatively numerous components of less importance. As the status descends, the number of the corresponding ranks increases. The coenotic paradigm states that this dependence is usually of a hyperbolic nature

$$P_i = \frac{P_1}{i^{\beta}},$$

where i is the rank number, P1 is the first rank representation. The hyperbolic rank parameterization of complex hierarchic structures in principle is related to their self-similarity. In the study observed this relation is being investigated as regards to the landslide processes and risk assessment in the karst areas by means of multi-fractal formalism methods.

Key words: rank, hierarchic structures, risk assessment, multi-fractal formalism

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ANALYSIS OF URBAN MORPHOLOGY IN TERMS OF SPATIAL AND HISTORICAL ASPECTS

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Abstract: The article presents the results of investigation of the spatial structure of Nizhny Novgorod historical development performed by means of the fractal analysis methods and GIS technology. The investigation revealed the most significant trends and dynamics of the city development with regard to the population density and road network. The results have been compared with those obtained for the cities of the Nizhny Novgorod industrial agglomeration, the Volga basins and some of the large megalopolises of the world.

Key words: urban area, fractal analysis, GIS technologies, transport infrastructure

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RESEARCH OF SUSTAINABILITY OF ELECTRIC LINES IN CONDITIONS OF FOREST FIRE

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Abstract: Forest fires make damages to large areas. They cause the death of many animal and plant species. Very significant are the damages to the technical infrastructure, which is built in the forest, like the power lines. According to the national legislation there are provided various measures which refers to limitation of these fires and protection of power lines. In fact, it appears that in many places they are ineffective. The authors had made many experiments. The results can be used for calculation of the exact distance between forest and the power lines. It depends of height and density of vegetation.

Key words: safety, forest fires, power lines

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GIS AND RS-BASED MODELLING OF POTENTIAL NATURAL HAZARD AREAS – CASE STUDY: PEHCHEVO MUNICIPALITY, REPUBLIC OF MACEDONIA

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Abstract: Because of changing environmental factors mostly due to the raised human impact, the Republic of Macedonia (25 713 km²) is highly exposed to natural hazards, especially to flash floods, excess erosion, landslides, heat waves, droughts, forest fires and earthquakes. Except the earthquakes as uncontrolled natural phenomena, the number of other hazards gradually increases in last decades generally due to climate change causing significant damages. Thus, identification of potential natural hazard areas is very significant for better prevention and protection of landscape and population. One of the regions heavily endangered by natural hazards is Pehchevo municipality (208.2 km²) in the easternmost part of the country. This municipality in upper Bregalnica catchment is selected as a test area for complex based GIS modelling of potential hazard sites. With selected digital vector and raster datasets and its geoprocessing, models of erosion, landslide potential, floods and forest fires are produced. According to the dynamic influencing factors, three scenarios for each treated natural hazard process are produced compared and corrected by field research and monitoring. Finally, all models are combined showing areas with some degree of potential natural hazard.

Key words: natural hazards, excess erosion, landslides, floods

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ASSESSMENT OF THE EROSION RISK USING GIS-BASED GEOMORPHOMETRIC ANALYSIS AND EROSION RESPONCE UNITS IN THE CATCHMENT OF TSAPAREVSKA RIVER (MALESHEVSKA MOUNTAIN, BULGARIA)

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Abstract: The dynamic of the geomorphologic erosion processes can be identified, characterized and modelled using a Response units approach. This study presents the application of the Erosion Response Units (ERU) concept in the catchment area of Tsaparevska river (Maleshevska Mountain, Bulgaria) using geographic information system (GIS). ERUs give information about the spatial distribution of different erosion processes and anticipate their future impacts on land cover. In this work they were delineated through geomorphometric analysis of digital terrain model (DTM), land cover data and GIS-analysis.

Key words: Geographic Information System (GIS), Erosion Response Units (ERU), digital elevation model (DEM), Maleshevska Mountain, erosion risk

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MULTI-HAZARD ASSESSMENT USING GIS IN URBAN AREAS: CASE STUDY: URBAN AREA OF BANJA LUKA MUNICIPALITY

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Abstract: The increased vulnerability by natural hazards in many urban areas, especially in developing countries is a major reason of concern. Therefore emphasis should be given to the reduction of vulnerability in urban areas, which requires multi-hazard assessment in order to make recommendations for prevention, preparedness and response. The research presents a technique for natural hazard assessment using GIS and cartographic approaches with multi-hazard mapping in urban communities, because natural hazards are a multi-dimensional phenomena which have a spatial component. Therefore the use of Remote Sensing and Geographic Information Systems has an important function and become essential in urban multi-hazard assessment. The first aim of this research was to determine the geographical distributions of the major types of natural hazards in the study area. Seismic hazards, landslides, rock falls, floods, torrential floods, and excessive erosion are the most significant natural hazards within the territory of Banja Luka Municipality. Areas vulnerable to some of these natural hazards were singled out using analytical maps; their area relative to the total area of Banja Luka Municipality was defined, along with the total surface area that is vulnerable to each type of natural hazard. Based on these analyses, an integral map of the natural hazards of the territory Banja Luka Municipality was created using multi-hazard assessment and the total vulnerability was determined by overlapping the results. The detailed analysis, through the focused research within the most vulnerable areas in the study area will highlight the administrative units (urban centres and communes) that are vulnerable. The results presented in this article are the first multi-hazard assessment and the first version of the integral map of natural hazards in the Republic of Srpska.

Key words: natural hazard, vulnerable areas, multi-hazard assessment, Banja Luka municipality

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COLD SPELL IN FEBRUARY 2012

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Abstract: The work presented in this paper includes the synoptic situation during the cold spell in February 2012 as well as climatological analysis of the temperatures (mean, maximum and minimum daily), precipitation and snow cover. Moreover, the assessments of the number of consecutive ice days in addition to daily temperature anomalies from the average for 1961-1990 are presented. The cold spell was detected using the daily percentile method of minimum temperatures with the calculation of its intensity as well. Spatial distributions are depicted in charts, figures and maps. Furthermore, this paper provides the description of the consequences caused by the cold spell.

Key words: cold spell, synoptic analysis, consecutive ice days, snow depth

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ANALYTICAL EVALUATION OF SOCIAL VULNERABILITY TO NATURAL AND TECHNOLOGICAL HAZARDS WITHIN THE DANUBE FLOODPLAIN, THE CALAFAT - TURNU MĂGURELE SECTOR (ROMANIA)

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Abstract: The main objective of the present research was the development and employment of predictive vulnerability indicators (as opposed to diagnostic indicators of risk), by using publicly available data connected to social, economic, and political factors. As important part of the overall place vulnerability, the social vulnerability sub-index can by built upon a set of interrelated factor groups, such as population characteristics (e.g.: population density, annual population growth rate, birth rate), vulnerable groups (vulnerable age groups, people with disabilities, female ratio, average household size, etc.), preparedness level (education level, rate of mandatory insurance coverage, number of volunteers in disaster-related NGOs, etc.), health service capacity (number of hospital beds, medical staff, etc.), and shelter capacity (i.e. sheltering possibilities, etc.). Directly related to the social issues proper, the economic vulnerability sub-index can be built upon factor groups including employment (e.g.: unemployment rate, employment of women) and other welfare-related indicators (GDP age dependency ratio, rate of socially dependent population, renters, number of industrial establishments, number of bank branches, etc.). Given the fact that the Danube floodplain sector in analysis meets the characteristics of a typically rural space (with few exceptions) and represents a cross-border area, there can be argued that a complete analysis of social and economic vulnerability needs to concern multiple social levels: from the individual and household (micro society), the local community related to proximity of members (meso-society), to the regional, national (macro-society) and even global level (concerned with the relationships between different societies). A key finding of the research is the need to understand the impact and role of vulnerability analysis on planning and policy-making at the state and local level, as it applies to the investment of funding and resources in hazard mitigation.

Key words: Danube floodplain, social vulnerability, economic vulnerability, natural and technological hazards, statistical and GIS analysis

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THE POTENTIAL OF BULGARIAN SPA HOTELS TO HOST VICTIMS OF NATURAL HAZARDS

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Abstract: A natural disaster is a major adverse event resulting from natural processes of the Earth which affects a vulnerable area and causes loss of life, health, property and other economic values. The issue of mitigating the negative impact of natural hazards on the society is of great importance today when we strive to keep social sustainability. Common immediate negative consequences for people who survived a natural disaster are losses of relative and friends, health, home, other property and values. The stress and the psychological pressure worsen even more the health status. So there is need of arranging in short term the accommodation and recreation of the victims of natural disaster. These two tasks can be successfully solved by using the potential of the tourist industry and especially of health tourism industry. The tourist infrastructure can ensure both accommodation and recreation of large groups of people, especially in short terms (15-30 days). In most cases these terms are enough to overcome the stress and to ensure enough time for finding long-term living solutions. The aim of this article is to study the potential of Bulgarian tourism infrastructure (hotels) and especially health (SPA, wellness) tourism infrastructure to ensure recreation for victims of natural hazards.

Key words: natural hazards, health, SPA, hotels

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THE PROBABILITY OF FLOODING WAVE OCCURRENCE AND THE VULNERABILITY OF THE KOSOVO TERRITORY SETTLEMENTS

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Abstract: The work displays the presumed laws of flooding waves which would occur if the 1976 situation when the great floods in Kosovo happened reoccurred again. On a 1:300000 multilayer map of Kosovo and Metohia, there are areas which would have been flooded in case of a maximum flooding wave, and what is also shown is the areas which were covered in water as the average was measured, including the areas used as projects of minimal flooding wave value. There is a layer showing the points with regular flood defense, including the places where protection needs to establish. The map includes the ratio of 1:300000, whilst the areas are calculated with the help of processing their dynamic static's, as well as using the formulae Gumbel Distribution and Weibull Formula. The data have been calculated with their maximum value, including the average and the minimum of flooding period embracing the time of 40 years.

Key words: the multilayer digital map, Kosovo and Metohia flood areas, Gumbel Distribution, Weibull Formula

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INUNDATIONS IN THE DELTA OF THE NORTHERN DVINA RIVER

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Abstract: This paper provides information about the types, factors and features of ice dam and storm surge inundations in the Northern Dvina River delta, new methods and results of their research, changing the situation with inundations for a long time-period. This article contains data on current structure and regime of the Northern Dvina delta, changes of hydrological factors in XX-XXI centuries.

Key words: delta, inundations, ice dams, surges

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DOES BELGRADE (SERBIA) NEED HEAT HEALTH WARNING SYSTEM? SUMMER 2007 AS A WARNING

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Abstract: The aim of this paper is to investigate whether Belgrade (Serbia) is suitable candidate for introduction of Heat Health Warning System (HHWS). Belgrade has high population density, considerable share of built up area and lot of multi floor buildings that are factors of heat-health vulnerability. We analyzed the impact of weather conditions on human health in Belgrade during the summer 2007 that was extremely warm in Southeast Europe and Serbia. Daily cardiovascular, cerebrovascular and respiratory mortality counts were used in Poisson regression model with air temperature as predictor variable. Also, three different heat wave indices (Warm Spell Duration Index, apparent temperature and index based on daily minimum temperature) were tested in order to estimate their ability to capture episodes with mortality higher than expected. The temperature has the highest influence on cerebrovascular and cardiovascular mortality, while slightly modifies respiratory mortality. Even thought the Law recognizes the heat wave as natural hazard, there is no concrete measures and action for prevention of excess mortality. Given the results we got, it is recommended that the HHWS should be implemented in health protection plans in Belgrade.

Key words: Heat Health Warning System, Belgrade, summer 2007, Poisson regression, excess mortality

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THE ANALYSIS OF HEAT WAVES AND THEIR IMPACT ON ENERGY CONSUMPTION

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Abstract: Instrumental observations of air temperature reveal increasing tendencies in the occurrence of heat waves. In the last few years, for instance in 2003, 2007 or 2012, heat waves in Europe had effects on human lives, agriculture, energy consumption and other energy demands. Impacts of extreme events are more serious in the urban areas and when extreme weather conditions prevail over extended periods (for instance, more than 10 days). The aim of this study is to determinate and analyse heat waves periods in the last few years and reveal their impact on electrical energy consumption. The focus of this research is in urban areas, according to two reasons: 1) urban areas characterize a huge population concentration in the small spatial area and 2) urban areas are the largest energy consumer. In this study we used daily air temperature data at 2 m above ground from meteorological stations of Republic Hydrometeorological Service of Serbia and daily electrical energy consumption data from Electricity Distribution Company "Elektrovojvodina" Ltd. We have analyzed load forecast error for heat waves periods and we have suggested methodology for improvement of forecasting results. Forecaster is based on support vector machines technology.

Key words: air temperature, heat waves, energy consumption, Serbia

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SOCIAL ASPECTS OF NATURAL DISASTERS IN RUSSIA

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Abstract: At the end of July, August and the beginning of September, 2010 in Russia in all territory of Central federal district and in other regions of Russia there was a difficult fire situation because of an abnormal heat and lack of a precipitation. Peat fires of Moscow area were accompanied by a smell of burning and strong smoke in Moscow and in many other cities. For the beginning of August, 2010 in Russia fires captured about 200 thousand hectares in 20 regions. The strongest fires were in the Ryazan and Nizhny Novgorod areas and Mordovia where actually there was a real crash. As the main reasons for accident it is possible to call drainage of bogs, peat self-ignition, temperature inversion and difficulties of suppression of a peat fire. Consequences of accident are characterized by a death toll (for August 7, 2010 the death of 53 people is recorded), large-scale material losses (127 settlements are in whole or in part destroyed; more than 1 200 houses are destroyed). Accident was accompanied by smoke of the cities, growth of number of diseases and mortality. The important role in decrease in negative consequences of accident was played by the international help of Russia which rendered Serbia, Italy, Ukraine, Republic of Belarus, Armenia, Kazakhstan, Azerbaijan, Bulgaria and other countries. In the report the assessment of action of the authorities in fight against accident, legal mechanisms of protection of the population from consequences of natural disasters is stated. The information scandals accompanying specified events, and also actions of communities of volunteers and participation in events of representatives of various faiths are described.

Key words: fire, consequences of accidents, social roots of natural disasters

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ASSESSMENT OF THE POPULATION'S LEVEL OF PREPAREDNESS AGAINST NATURAL DISASTERS

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Abstract: Survey was carried out on the state of preparedness of the population for natural disasters. Their awareness is acknowledged in preparation for the various types of natural disasters. Risks are analyzed and recommendations are made for elimination the weaknesses in case of disasters. The study is based on the principles and regulations for dealing with disasters of the National Service Civil Defense, renamed into Fire Safety and Civil Protection subordinated to the Ministry of Internal Affairs since 2010.

Key words: population, preparedness, disasters, response, civil protection agencies

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TECHNICAL, FINANCIAL AND ECONOMIC EFFECTS OF NATURAL DISASTERS ON WASTEWATER TREATMENT SYSTEMS: THE CASE OF BALKAN COUNTRIES

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Abstract: The aim of this paper is to analyze the impact of natural hazards on the municipal wastewater treatment systems in the Republic of Serbia and in the region. The special attention was given to the operation of these systems in the occurrence of droughts and floods, which would affect and endanger the proper operation of the treatment process. In such events, drought and floods, the treatment plants operate in different regime than designed for, which may significantly affect financial and economic costs. This paper gives view to the needed changes and adjustment to the treatment process operation and mitigation procedures that would provide cushioning of the adverse effects of drought and floods. Accent was given to the flood protection measures, changes in the biological treatment in cases of increased or decreased pollution loads. In addition, this paper presents few examples/case studies, in the region, of their readiness to deal with such occurrences.

Key words: flood protection, droughts protection, overflows, by-pass, treatment efficiency

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POSTTRAUMATIC STRESS DISORDER (PTSD) AMONG ADOLESCENTS AFTER THE EARTHQUAKE IN BULGARIA (MAY - 2012)

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Abstract: The present research is an assessment of the PTSD among adolescents after the natural disaster. It involves Bulgarian adolescents who were close to the epicenter of the earthquake in Bulgaria in May 2012. The project is focused on assessing the stress status of adolescents from the affected region as well as commentary on some individual and social features that have cumulative effect on mental health. This research diagnoses the stress symptoms in adolescents being examined. The juxtapositional analysis has outlined several shocking life experiences and individual features, contributing stress as well as buffering ones. The research found out that there is a need of performing mass mental health screening among young people in the country. The observations made concerning the PTSD provide essential information for planning the resources required for health prevention. Competent aid and support given in time to students who had experienced stressing events would be an investment in their health development.

Key words: posttraumatic stress, mental health, social support

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THE IMPACT OF HATURAL HAZARDS ON THE LOCAL COMMUNITIES IN THE SOUTH WEST OLTENIA DEVELOPMENT REGION

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Abstract: The studied region with an area of 29,212 km2, has a population of 2,225,108 (on the 1st of July, 2011) that is distributed within five counties (Dolj, Olt, Vâlcea, Gorj, Mehedinti) and concentrated in 40 cities and 408 communes. In the region there are present all major forms of relief, with a geomorphological and lithological-stratigraphic complexity which favors the occurrence of some natural hazards. Along the time, the local communities, in the region, had been affected by the following types of natural hazards: hydrological, geomorphological, climatic and seismic. From the processed statistical data it resulted that the most frequent are the climatic hazards (drought, heavy rains, heat waves, etc.) especially in the southern part of the region. Geomorphologic and hydrological hazards, even less frequent and intense as compared to climatic hazards, also display high occurrence, especially in the Subcarpathian and piedmont region. The most reduced category is that of seismic natural hazards, as the region is not one with a high risk of occurrence for this type of hazard. The quantitative and qualitative analysis of natural hazards in the studied region enabled us to correlate these events with the impact on the inhabited space. There have been also analyzed the cause-effect relation from the point of view of the impact caused by the event on the society, as well as the role played by the society in triggering such events.

Key words: natural hazard, local communities, drought, floods, landslide

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THE IMPORTANCE OF GEOGRAPHERS IN THE STUDY OF NATURAL HAZARDS

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Abstract: This paper is about geographers, respectively, their role in studying natural hazards and disasters. The first part of this article is about analysis of electronic visible results (papers, conferences, projects) of the scientists. The papers, as the most often form of contribution in studying of natural hazards and disasters, have been analyzed according to their subject matter, who wrote them, respectively, how much the geographers were involved in that matter, according to the time when they were written and journals in which they were published. In the second part of this article is given attention to the geographers who are not occupied with the science. Investigation is made concerning their attitudes about their knowledge acquired during their studies – how much it was used within their job so far, or it could be used in order to have certain influence to their students, colleagues or any local inhabitants for education, prevention and protection from natural hazards and disasters. The attitudes of geographers about knowledge of certain types of natural hazards were illustrated by usage of descriptive statistics. By t-test were searched differences of attitudes between generations who matured with Internet and older ones. One-factor analysis of ANOVA variance was used for identification of differences between attitudes of geographers who had different occupations. Post-hoc Tuckey HSD test separated geographers in tourism as those who do not see the possibility to contribute in studying and preventing natural hazards and disasters within their profession. The aim of this work was to draw attention that the geographers who were not involved in science, felt ready and competent for monitoring of natural hazards at the local level and such written tracks might serve for future scientific investigations.

Key words: natural hazards, Serbia, geographers

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HIKING TOURISM DEVELOPMENT IN PROTECTED AREAS AND NATURE HAZARD PREVENTION IN THE LAKE BAIKAL NATURAL TERRITORY

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Abstract: Since 2010, recreational development has been permitted in strict nature reserves (zapovedniks in Russia), the most highly protected category of Russian Federal Protected Areas. As zapovedniks comply with the 1b IUCN category for wilderness preservation, human activities within the reserves have been limited and, consequently, there has been little research on the natural hazard impact for tourism. The type of recreational use permitted in the territories and their buffer zones is called Educational Tourism. It is identified as "as a specialized type of ecological tourism where the main goal is an introduction to natural and cultural attractions". Hiking is seen as one of these suitable types of tourism within the territories of zapovedniks, due to its low impact on natural features. As hiking trails are laid through natural landscapes, it is possible that natural disasters can both damage the infrastructure and cause fatal injuries for visitors. During the planning stages of trail construction, natural hazard monitoring should be conducted. Baikalskii Nature Biosphere Zapovednik in the Lake Baikal region is used as a model territory where scientific research and engineering are employed to better develop hiking tourism. Along with the monitoring of natural processes, several scenarios for trail planning, construction, and maintenance are being analyzed under the threat of mud slides, avalanches and floods.

Key words: Educational tourism, Zapovednik, natural disasters

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VULNERABILITY ASSESSMENT FOR NATURAL HAZARDS TO PROTECTIVE MEASURES

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Abstract: The most promising area of research for assessment of vulnerability of territories from natural processes should be based on structural-dynamic concept of geosystems. Its essence consists in transition, under external influences, natural systems from a state of stable in an unstable. At the same time is not excluded the possibility of evaluation of vulnerability of the territory with the status of components of the environment and objects under the influence of the processes.

Key words: vulnerability, geosystems, natural processes, geological assessment

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POSSIBILITIES OF REDUCING RISKS OF ENVIRONMENT CONTAMINATION FROM SEWAGE SLUDGE

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Abstract: The paper deals with the examination of samples of sewage sludge mixed with charcoal. The aqueous extracts were prepared from the experimental samples of the sewage sludge mixing with charcoal. The extracts were monitored by the selective physico-chemical parameters. The ecotoxicological properties of charcoal with the addition of sewage sludge were evaluated based on the ecotoxicological tests performed in this experiment. Our investigation obtained results and it is considered to improve the properties of sewage sludge in its future recovery and minimize the negative impacts on the environment, which are to a large extent, sewage sludge unsuitable for further use.

Key words: sewage sludge, charcoal, nutrients, ecotoxicological tests

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POSSIBILITIES OF THE REPUBLIC OF SERBIA FOR REDUCING VULNERABILITY TO NATURAL HAZARDS

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Abstract: Vulnerability is an essential feature of an element at risk (community, region, country, the environment) which determines the expected damage caused by a hazard. Vulnerability modified over time and it depended on physical, social, economic and environmental factors. Vulnerability became multidimensional, multidisciplinary, multi-sectoral and dynamic in contemporary circumstances. In the past decades, vulnerability to natural hazards took precedence over technological and other hazards threatening the community. The necessity to assess threat, vulnerability and the prevention of natural hazards was emphasized in the key national normative legal acts of the Republic of Serbia. A resolute commitment of the country to lay down the laws to regulate this field and establish a system to make a functional response to natural hazards through institutions was followed by difficult circumstances in practice. In addition to permanent flood hazard vulnerability, landslide and earthquake vulnerability, weak socio-economic profile i.e. the insufficient flexibility of the community and the unclear role of government bodies, municipal civil protection service and the service for protection from natural disasters were also insufficiently equipped. Nowadays, government efforts to solve problems in order to improve its own possibilities for reducing vulnerability to natural hazards are evident. The most important are those related to proper financing of the protection system. The application of SCN model would provide a more stable transfer of financial resources, as well as the transfer of necessary manpower and material resources from national to local level.

Key words: vulnerability, natural hazards, possibilities, SCN model

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SPATIAL ANALYSIS AND MAPPING OF FIRE RISK ZONES AND VULNERABILITY ASSESMENT – CASE STUDY MT. STARA PLANINA

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Abstract: During the turn of the century, the current data of registered fires in Stara planina were insufficient to up date and incomplete, which directly conditioned unintended purpose of prevention and fire protection. With the advent and development of new technologies (remote sensing, GIS, GPS, etc.), since 2010 various data patterns of fire have been collected, recorded, processed and analyzed. Based on the collected and processed data since 2010 preventive measures against fire and better management of natural resources of protected areas have been implemented. The aim of this paper is spatial analysis and mapping of risk zones of fire in Stara planina, consisting of different vegetation cover, the complex structure of the terrain and heterogeneous composition of the soil. In Stara planina, a total of 44505 fires in the open space, in the period from 2010 to 2012, was registered. Cartographic locating, plotting the recorded "hot spots" and analyzing topography (aspect, slope, etc) and collected data for this period, the authors identified and zoned endangered belts of Stara planina.

Key words: risk zones, GIS, remote sensing, fire, Stara planina, Serbia

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SPATIAL AND TEMPORAL COMPARISON OF VULNERABILITY TO NATURAL DISASTERS IN SERBIA

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Abstract: The frequency of natural disasters and the extent of their consequences at a global level are constantly increasing. This trend is partially caused by increased population vulnerability, which implies the degree of population vulnerability due to high-magnitude natural processes. This paper presents an analysis of vulnerability to natural disaster in Serbia in the second half of the 20th and the early 21st century. Vulnerability changes were traced on the basis of demographic-economic indicators derived from statistical data for local government units (municipalities) provided by the Statistical Office of the Republic of Serbia. Calculations were performed in the Geographical Information System (GIS) environment. The results of the study show that spatial and temporal vulnerability variations are causally correlated to changes in the selected components. Significant rise of vulnerability is related to urban areas, while lower values are characteristic for other areas of Serbia; this is primarily a consequence of different population density.

Key words: natural disasters, vulnerability, Serbia

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BREAKING THE CULTURE OF ISOLATION: PARTICIPATORY CAPACITY AND VULNERABILITY ANALYSIS (PCVA) AS A TOOL FOR COMMUNITY SAFETY AND RESILIENCY

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Abstract: Disaster risk reduction and climate change adaptation programs are important in the Philippines given the country's vulnerability to different kinds of disaster risks and climate change impacts. As an archipelagic country, these programs are most urgent among small island communities due to their unique biogeographic characteristics. While many small islands are rich in biodiversity, they also have fragile ecosystems and they face the continuing threat of isolation from the mainland where various social and economic services usually emanate. A capability-building program was initiated in four small island communities in the Municipality of Carles, Province of Iloilo, Philippines to enhance their competencies for disaster risk reduction and management (DRRM) and climate change adaptation (CCA). The program utilized the Participatory Capacity and Vulnerability Analysis (PCVA) to enhance people's appreciation of hazards and risks that are unique to their contexts. It was revealed through the PCVA that small island communities have inherent capacities and resources for DRRM and CCA. Unfortunately, these are not properly harnessed because of their isolation and weak support from the government. Their distance from the centers of social and economic services exacerbates this condition. Breaking the problem of isolation is a key strategy for small island communities to fully realize their potentials as fundamental building blocks in promoting safety and resiliency.

Key words: small islands, participatory capacity and vulnerability analysis, risk reduction, adaptation, capability building

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EVALUATION OF GEOGRAPHY TEACHING IN SERBIA CONSIDERING ITS ROLE IN NATURAL DISASTER PREVENTION

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Abstract: Large part of the Serbian territory is subject to natural disasters, while prevention is at a low level. As the disaster risk decreases mostly through reduction of vulnerability and through increase of population recovery potentials, it is clear that risk education has a considerable role in prevention, leading to risk decrease, according to the Pressure-and-Release model. Numerous studies stress the importance of geography teaching in the disaster knowledge transfer. Primary and secondary education are obligatory in Serbia, and the majority of people enters this process. Therefore, geography - as a school subject and a complex science with both natural and social component - is recognized as the best tool in systematic natural disaster prevention. The research shows that children in Serbia do learn about natural hazards, but not in a way which enables the appropriate application of the knowledge gained. Possible solutions which are relatively feasible include: the improvement of curricula and textbooks, raising the awareness of teachers and pupils about their role in natural disaster prevention, professional training of teachers and creative approach in teaching.

Key words: natural hazards, geography teaching, prevention, Serbia

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THREATS OF NATURAL CHARACTER, FACTORS AFFECTING SUSTAINABLE DEVELOPMENT OF TERRITORIES AND THEIR PREVENTION

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Abstract: XXI century is characterized by globalization of socio-economic processes, economic growth, and excessive consumption of natural resources that leads to imbalance in socio-economic systems. Significant threats to the sustainable development of territories are natural and anthropogenic disasters, the extent and severity of which significantly increased in recent decades. They do great damage to economy and environment, often accompanied by loss of human lives.
Russia with its broad territory, significant difference in climate conditions, is exposed to the wide range of natural hazards and disasters. The most dangerous are earthquakes, floods, forest fires.
About 20 % of the Russian Federation is situated in zones of high risk, which are inhabited by more than 20 million people. Area of flooding as a result of floods can reach over 400 km2. Annually in the forests appear from 100 to 300 thousand of fires on the total area of 1.5 - 2.5 million hectares. The impact of natural disasters on the sustainable development of territory is considered in the article as an example of one of the Russian regions – the Republic of Mordovia. It was analyzed the dynamics of emergencies for the period of 2000 – 2012, paid attention to natural emergencies (forest fires and floods). Despite the fact that occurrence of emergency and catastrophic situations of natural character happens spontaneously, size of damage they do largely determined by timeliness and accuracy of the prediction and adoption of adequate preventive measures. In this regard, the article provides recommendations to reduce threats of natural character for the sustainable development of the Republic of Mordovia. They cover a range of activities on monitoring of natural phenomena, protection of the population from emergency situations to minimize potential damage, training of population in the face of natural disasters, development of economic policy in the region and training of personnel in the sphere of environmental management.

Key words: natural disasters, emergencies, forest fires, floods, sustainable development of territory, economic damage

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AN OPEN STRATEGY FOR PROTECTION OF FOREST FROM FIRES

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Abstract: Fires make damages to forest ecosystems. The 85-98% of all fires are caused by human activity. Depending on the specific conditions in the beginning of the risky process, the burning of the trees, bushes and grass vegetation is the same in Bulgaria, Europe and the rest of the world. For this kind of disaster there are no borders. The legislation for protection of forest need to be updated. The European countries need to work together for protection of forest ecosystems. There is need for collaboration between scientific researchers from interested countries for preparing of an strategy to protect the forest from fires.

Key words: an open strategy, protection, forest ecosystems, collaboration

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POSSIBILITIES OF THE CLIMATE CHANGE MITIGATION IN BOSNIA AND HERZEGOVINA

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Abstract: Climate change is one of the most contemporary world ongoings because of its scientific and global political-economic dimension. Its impacts are manifested by the numerous disorders in the functioning of the normal climate system, especially from the aspect of the thermic and pluviometric disorders and related hydro-meteorological disasters: droughts, floods etc. Today, all countries of the world are trying to develop the basic scientific-expert human capacities and technological-material resources in the aim of the timely reactions on the all of the impacts the climate change has on the natural and social-economic resources. Bosnia and Herzegovina is the non-annex country, therefore it isn't the part of the Climate Change Convention, but it is actively included in the process of the national report production that treats climate change from the all aspects. Climate change mitigation in Bosnia and Herzegovina represents one of the basic fields based on the mitigation potential investigations and the creation of the different scenarios used for the mitigation and reduction of the mentioned negative impacts. The numerous investigations are carried out in that aim, striving to define the green house gasses emission levels according to the emission sources as the total amount of the omitted green house gasses by the each year as well. Also, their sink capacities are investigated from the aspect of the protection of the natural sink zones as from the aspect of the definition of the measures and activities in the aim of their reduction in the field of the economy as well.

Key words: climate change, Bosnia and Herzegovina, mitigation

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ATMOSPHERIC NATURAL DISASTERS IN SERBIA - MANAGEMENT EXPERIENCE AND ECONOMIC EFFECTS

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Abstract: Natural disasters occur as a result of an action of natural forces and represent limitations in spatial planning and efficient spatial development, with different consequences in terms of scope on humans, living things and tangible property. Consequences can be ecological, economic, in terms of health, demographic, social, psychological, etc. Weather modification management involves policies, methods, techniques and technologies that affect atmospheric features in order to make atmospheric water useful for humans, while eliminating its negative effects. Highly significant risk of natural disasters in Serbia is related to hailstorm disasters and droughts as atmospheric elementary disasters. The goal of this paper is to present certain methodologies and experience in Serbia in the weather modification management, mainly in the hailstorm processes. This paper provides analysis and critical review of the methodology of an action, with the analysis of the economic benefits. Cost-benefit analysis of a hail suppression project in Serbia was performed. The results point to the economic justification of some aspects of artificial influence on weather disasters.

Key words: atmospheric hazards, storms with hail, management, economic effects

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REDUCTION OF RISK LEVEL AS ONE OF THE MAIN TASKS OF THE KARSTIFIED TERRITORIES DEVELOPMENT (IN COVERED KARST REGIONS)

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Abstract: The paper presents the experience of application of the residual karst risk concept, as well as coefficients of karst risk level reduction for justifying designs of karst-protection constructions. According to the practice of designing on the karstified territories in the Nizhny Novgorod region, at present there is a necessity of conducting special research on the interaction of building structures and foundation. Numerous accidents can serve vivid examples for doing this. In this situation it is important to approach the issue of safety in a proper way taking into account possible economic, ecological and social damage. This issue can be solved by introducing the parameter of karst risk level LR, which permits to take into consideration construction parameters of objects (service life, design philosophy), as well as all conditions and mechanisms of interaction of the foundation with the construction (sinkholes, local sinking, karst-suffosion subsidences, etc.). It is important to underline that the importance of solving this issue is stipulated in the Russian Federal laws. Depending on the value of the karst risk level certain karst-protection measures can be implemented. For building projects, the reduction of the karst risk level LR to a permissible level (conventionally accepted as one) is one of the most important research tasks of the karstified territories development, the solution of which permits to justify the karst protection measures.

Key words: karst, risk, sinkhole, structure, protection

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FIRE PROTECTION PROBLEMS WITH LARGE FOREST FIRES IN DELIBLATSKA PEŠČARA (SERBIA)

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Abstract: Purpose - The aim of the paper was to investigate the major forest fires in Deliblatska peščara, as well as to analyze the efficiency of fire protection measures. Design / methodology / approach - The analysis included interviews with participants in extinguishing the major fires. The questions referred to the course of fires, as well as to the main fire protection disadvantages. The documentation of the "Banat" Forest Management - Pančevo (Public Enterprise "Vojvodinašume") was also used in the paper for the period 1948-2012. Findings - The major forest fires in Deliblatska peščara in the studied period were recorded in 1973, 1990, 1996 and 2007. Although they account for only about 1.5 % of the total number of fires, they collectively have invaded more than half of the total burnt area and more than two–thirds of the forest area. According to the surveys, the main characteristics of these fires were: frequent appearance of new fire hot spots, strong wind variable in direction which crucially affects the spread of fire and the impossibility of direct action on fire. The main disadvantages of fire protection were: inefficiency of fire breaks, blockage of forest roads for the passage of vehicles and the lack of the modern means of fire protection equipment. Research limitations / implications - Given the specificities of the studied area (the absence of surface water, sandy soils, microclimate conditions and vegetation composition), the research results cannot be fully generalized for Serbia. Practical implications - The research results indicate the need for making changes in the fire prevention system, as well as the possibility of fire danger forecast based on the heliocentric hypothesis. Originality / value – What has been the importance of the paper is that it provides the basis for a new approach to the planning of fire prevention measures.

Key words: forest fires, Deliblatska peščara, solar activity

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WATER QUALITY CHANGES AFTER THE EARTHQUAKE IN KRALJEVO, 2010

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Abstract: Many studies have examined earthquake's impacts on hydrological changes such as drying and flooding of water wells, fluctuation of groundwater levels, changes in water quality. This paper aims to present water quality changes after the earthquake in Kraljevo, on 03 November, 2010. The water parameter concentrations were measured before the earthquake in 2010 and after it in 2010 and 2011. The data from two hydrological stations were used: Kraljevo Zapadna Morava and Kraljevo Ibar. The Canadian Water Quality Index was applied for the calculation of water quality. This method defines the overall water quality and the specific quality of water used for drinking, aquatic habitats, recreation, irrigation, and livestock. A significant decline in the quality of water used for aquatic habitat and a less significant one in the overall quality and the quality of water used for irrigation was recorded in the hydrological station Zapadna Morava. Increased heavy metal concentrations were detected, which caused water quality impairments. A minor decline in the overall water quality and the quality of water used for aquatic habitats was recorded in the hydrological station Kraljevo Ibar.

Key words: water quality, earthquake, CWQI, Kraljevo

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THE RISK OF SURFACE WATER CONTAMINATION BY OIL PRODUCTS

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Abstract: The aim of this paper is to assess the surface water contamination with oil substances in forest. The usage of the forest mechanisms for felling, loading, and wood transportation belong to the activities which affect small but long-term natural environment contamination caused by mineral oil substances. These substances impact negatively on all components of the forest ecosystem. The oil substances were determined by spectrophotometric method in infra-red extent as unpolar extractable substances (NEL). The progress of NEL concentrations and harvest intensity in all sampled locations shows evident connection to harvest intensity and season of the year. To better understand the interaction of hydrocarbons in forest ecosystem we tested biodegradability of selected petroleum products.

Key words: water contamination, petroleum products, biodegradability, harvest

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INFORMATION SYSTEM OF FORECASTING INFRASTRUCTURE DEVELOPMENT IN TOURISM

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Abstract: Manuscript is devoted to the development of information system for tourist objects infrastructure growth and its practical implementation in form of information system using methods of fuzzy logic, theory of fractals and diffusion. Developed technology allows compute attractiveness of Carpathian region, structure, dynamics of the main tourist settlements Vorochta and Slavske, prospective territories for tourist business, growing strategies for region.

Key words: information system, information technology, knowledge base, the distribution of territory belonging to the urbanized, GIS.

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LANDSLIDES' INFLUENCE ON THE ENVIRONMENT

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Abstract: In the area of Bosnia, landslides on natural slopes are frequent occurrences that imperil some housing units, settlements, economic units and people's life or they imperil traffic safety on the roads, degrade agriculture and forest lands and they also lead to dislocation of surface and underground waters. The main causes of landslides' activation are changes in level of underground waters, chopping down of forest, great rainfalls, snow melting, long drought periods, changes in slopes, changes in load of a slope, rock's wastage, uncontrolled diversion of surface waters, earthquakes etc. Researches on landslides are carried out in order to establish the cause of landslide's origin and to find out efficient overhaul measures. Landslide's overhaul success depends not only on established causes of landslide's origin, but also on use of technical measures for stopping that process. Overhaul measures' carrying out is important in protection of the environment. This paper presents an analysis of co-action of natural factors and negative anthropogenic effect in a settled area, where landslides appear, by its studying and eliminating of causes we are creating the conditions for a successful stabilization of landslides. The paper shows some characteristic landslides with defining of geomorphologic, geologic, engineer geologic, hydrogeologic and geotechnical characteristics of the terrain.

Key words: landslides, environment, influence on the environment, natural factors, anthropogenic effect

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STANDARDIZATION IN THE SYSTEM OF THE NATURAL HAZARDS MANAGEMENT INSTRUMENTS

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Abstract: The article deals with the role of the standardization as an instrument of the natural hazards management. The author introduces the urgency of the sustainable development problem and explores the "sustainable development" term, which satisfies the requirements of the present time in a way that does not negatively impact on the future generation. The sustainable development concept and its elements are presented with the emphasis on the natural hazards management. The paper covers different approaches to the natural hazards management based on the ecology management standards (MS ISO 14000 series). The author studied the main directions of the ecology management system development and discussed the factors which influence this development and difficulties which delay ecology management systems spreading in Russia. The author pays attention to the international standards defining different aspects of the disasters management. The approaches to the disasters management are analyzed on the base of the ISO 22320:2011 "Societal security – Emergency management – Requirements for incident response". The article identified the ways of using the ISO 31000:2009 "Risk Management – Principles and Guidelines" in the natural hazards management process and substantiated the context of the decision-making process in the natural hazards management with the help of the standardization.

Key words: standardization, sustainable development, environmental management, risk management

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GIS IN THE MANAGEMENT OF NATURAL DISASTERS

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Abstract: United Nations International Strategy for Disaster Reduction defines risk as "a potentially damaging physical event, phenomenon or human activity that may lead to loss of life or injury, property damage, social and economic disruption or environmental degradation". Each hazard is characterized by location, intensity, frequency and probability. Goal of emergency management is to save lives, reduce human suffering and preserve economic resources before, during and after a catastrophic event. Timely and accurate information is crucial to the successful management of natural disasters. A unique tool for managing in natural disasters is the geographic information systems (GIS). GIS is most often defined as a "structured approach to collecting, archiving, analyzing, manipulating and displaying data having one or more physical components, using a combination of personnel, equipment, computer software, and organizational processes". GIS allows the combination of different types of spatial data with non-spatial data (attribute), and uses them as information in various stages of management. GIS can be used for efficient handling and analysis of spatial data and the creation of integrated geo-databases on biodiversity, weather, hydrologic, and socio-economic indicators, modeling simple/complex disaster linked with indices that reflect the area's vulnerability in natural disasters. Multi-temporal nature of natural disasters depends on six related stages: identification, prediction, preparation, mitigation, response and recovery. In our country, it is necessary first to understand the characteristics of current information resources, their functions and advantages in the management of natural disasters. In Serbia, the use of GIS in the management of natural disasters is pioneering activity from a scientific and practical point of view.

Key words: geographic information systems, natural disaster, management

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REMOTE SENSING AND GIS IN FLOOD MANAGEMENT

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Abstract: There are various ways for applying GIS and remote sensing in management of flooded area. Perhaps most important is early flood detection which is aimed at the production of scenarios for flood events, in order to provide information in real-time and also flooded zones mapping. The main aim is to identify flood events by comparing and integrating two methodologies based on different principles: the first is based on the identification of precipitation anomalies by the means of the analysis of pluviometric data, the second is focused on the analysis on remote sensed data for the detection of ground effects of flood events. Timely availability of geographic information about water bodies extension and, possibly, depth at an appropriate scale is fundamental for all response phases of the risk cycle. Both historical, to correctly identify the reference conditions or to produce scenarios based on historical events, and near real-time data, for the actual and precise identification of water covered areas, are thus essential. The main input data is satellite imagery, specifically the MODIS/Terra Surface Reflectance Daily products. The temporal compositing algorithm is based on daily images representing water bodies on the ground, generated by the use of band ratios and threshold techniques.

Key words: floods, MODIS, remote sensing, scenario

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CITIZENS AT RISK FROM EARTHQUAKE HAZARD IN DHAKA CITY: SCALING RISK FACTORS FROM HOUSEHOLD TO CITY REGION LEVEL

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Abstract: Dhaka city is under the looming threat of cataclysmic earthquake. However, the factors from which the citizens are at risk may not the same for its all parts. Dividing the city into three geographical scales: Old (Shankhari Bazaar), Developed (Segunbaghicha) and Newly Developing (Uttara 3rd Phase) areas, this research explores the risk factors of earthquake hazard from household to city-region level. Based on FGD at community level, in-depth interview of experts and policymakers, observation and secondary sources of data the study finds citizens of Old Dhaka are at high risk because of the obsolete and dilapidated building structures they live in whereas unauthorized high rise buildings is a massive threat for the dwellers living in developed Dhaka. The results of this research highlight that fact that enormous filling of low-lying lands enhances high earthquake risk and may cause severe liquefaction effects to the residents of newly developing areas of Dhaka. The comprehensive outcomes of this study are emphasized on raising the on-going public awareness programs, following the building codes strictly and implementing the disaster risk reduction approach into land use planning which can possibly reduce earthquake risk in Dhaka city.

Key words: Dhaka city, earthquake risk, city expansion, liquefaction, high-rise buildings

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DOCUMENTS AND MECHANISMS FOR MANAGEMENT OF NATURAL DISASTERS IN BULGARIA

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Abstract: A complete review is made, concerning the documents for natural disasters management at national, regional and local levels. The mechanisms and connections, as well as the organization of risk management in Bulgaria, are examined. A common rescue system and coordination of its constituent parts is provided. The activities and functions of the General Directorate "Civil Protection" at the Ministry of Internal Affairs for protection from natural disasters are clarified, as well as the communication and information between agencies and individuals. The subsystems of the integrated information system are analyzed.

Key words: documents, procedures, organization, management, civil protection agencies

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SPATIAL AND TEMPORAL ANALYSIS OF FIRES IN SERBIA FOR PERIOD 2000-2013

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Abstract: Spatial and temporal analysis of fires in Serbia for period November 2000-August 2013 has been performed to investigate whether spatial relationships exist among fire data. MODIS active fire data were used as fire locations. On such data, different tools of spatial analysis and spatial statistics were used to determine if there is any spatial relationship. Analysis included data screening, identification of land cover of fire locations, aspect, slope, elevation and solar radiation for each location. Later, different spatial statistics tools were executed against fire locations data, including Getis-Ord Gi* Hot Spots, Global Moran's I Spatial Autocorrelation, Anselin Local Moran's I Cluster and Outlier, Ordinary Least Square linear regression and Geographically Weighted Regression. Fire radiative power was used as dependant variable, while terrain morphology and solar radiation were used as explanatory variables. Results shows hot spots of fires in Serbia, and indicates that there is strong relationship between fire radiative power on one side and terrain morphology, land cover, solar radiation and spatial distribution on other side. These analyses have highlighted areas with very intensive fire use associated with land management practices.

Key words: fires, MODIS, spatial analysis, temporal analysis, spatial statistics, Serbia

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NATURAL HAZARDS AND THEIR EFFECTS ON AGRICULTURAL DEVELOPMENT (CASE OF THE REPUBLIC OF MOLDOVA)

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Abstract: The article describes the most frequent unfavorable natural phenomena in the Republic of Moldova, such as drought, hot dry-winds and strong winds, dust storms, hail, frost, glaze ice, invasion of sod webworms and others. Additionally it presents a number of methods for reduction of their damaging influence on the results of agricultural activity. The article showcases the devastating effect of webworms on the seeding of agricultural crop yield in mid-1970s and the coping measures undertaken in those years. In 2003, as a result of an unusual combination of natural and climate factors, a great damage was done to the seeding of agricultural crops. Similarly, abnormal heat during the summer of 2007 resulted in a disastrously low crop yield across the territory of the republic.

Key words: yield, drought, precipitation, hail, frost.

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THE OCCURRENCE OF A TORNADO IN SERBIA ON 31 MARCH 2013

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Abstract: Tornado occurs very rarely in the territory of Serbia. The occurrence of a tornado above Torda (Vojvodina, Serbia) on 31 March 2013 indicted the importance of monitoring such a dangerous weather phenomenon, knowing its characteristics and forecasting it. This paper analyzes the synoptic conditions and vertical structure of the atmosphere that prevailed during the development of a supercell with a tornado. Changes in temperature and air pressure are presented on mesoscale maps. The analysis was performed by using the Nonhydrostatic Mesoscale Model (NMM). The tornado occurrence was monitored via satellite images and radar characteristics of a supercell. The cause of tornado genesis has been ascertained. According to the EF scale, the tornado reached F0 intensity. Damages to roofs, power lines, trees and cars caused by the wind (>35ms-1) are also presented.

Key words: tornado, supercell, SRH, CAPE

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CAUSES AND CONSEQUENCES OF FLASH FLOODS IN THE UPPER BASIN OF DESNĂŢUI RIVER, ROMANIA

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Abstract: The Upper Basin of Desnăţui River is located in the south-eastern half of the Bălăciţa Piedmont, part of the Strehaia Platform. Desnăţui river basin is a tributary of first order of the Danube and it is monitored in two hydro-metric stations in the upper sector (Dragoia and Gabru). The specific feature of the hydro-graphical network is its temporary drainage, depending on the amount of rainfall received during the year. In the periods of high flow, the capacity of the river channels to support the volume of transported water is diminished and the floods may occur. Thus, flash-floods are responsible for the hydrological risks along the local rivers of the piedmont. In an attempt to analyse the impact of flash-floods on the local communities along the affected rivers, the research aims at correlating the periods characterized by high waters with the meteorological conditions that may produce them. In this context, the study will highlight the particularities of the flood events that took place along the two monitored rivers (Desnăţui and Terpeziţa) and their main tributaries, between 1970 and 2010. In order to accomplish the objectives, spatial and temporal analysis and synthesis using seasonal and monthly statistical data were made and characteristics the elements of the floods (rising, maximum discharge etc) were quantified. In the end, the article focused on a case study regarding the consequences of the flash flood from 2005, considered to be representative for the waterborne hazards in the investigated area.

Key words: Desnăţui, flash floods, hydrological risks

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FLOW-RATE IMPACT ON SURFACE WATER QUALITY: A CASE STUDY OF THE TIMOK RIVER BASIN

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Abstract: This study seeks to present research results that demonstrate the influence of the flow rate on river water quality on the example of the Timok River Basin; particular attention is paid to data for 2010, when floods occurred. The method used to establish water quality for the 1992–2011 period has been the Serbian Water Quality Index. The analysis covers various parameters (oxygen saturation, Five-Day Biochemical Oxygen Demand or BOD5, ammonium ion concentration, pH value, Water Total Nitrogen or WTN, Total Suspended Solids or TSS, orthophosphate concentration, electrical conductivity, temperature and the fecal coliform bacteria parameter) whose values were collected at four hydrological stations within the basin. The data obtained at each measurement station were averaged using the annual arithmetic average mean. The obtained quality results were further related to flow rates for the same time period. Research results have shown that the flow rate and water quality are inversely correlated. Having in mind the negative impact of excessively high flow rates on water quality and their flood-causing potential, which further implies great material damage and casualties, the authors of this study suggest measures to prevent this. These measures include limiting unplanned forest conversion and illegal development, channelization, dredging, education of the population potentially affected by floods, etc. and they are aimed at preventing floods and diminishing their negative effects.

Key words: Serbian Water Quality Index, flow rate, flood, prevention flood, the Timok River Basin

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SUMMER HAZARDS IN NOVI SAD

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Abstract: Review of summer atmospheric condition that may influence on human health and environment in city Novi Sad, Serbia is depicted in this study. Frequency of tropical days, heat wave duration and severity and erithemal ultraviolet (UV) dose during summer months (June-August) are analyzed for the period 1981-2009. The frequency of tropical days and anomalies of maximum temperatures above normal were on the rise 0.63 ^{o}C and 0.07 ^{o}C per year, respectively. A very low occurrence of heat waves was typical in the 1980s and early 1990s. The longest heat waves were recorded in 2003 (lasting 12 days) and 2002 (11 days) while the strongest were in 2007 and 2003. An empirical formula for estimating the daily sum of the erithemal UV radiation from global radiation during summer months has been derived and applied for reconstruction. The daily erithemal UV doses were the greatest in 2000 and 2007, 3997.32 J/m^2 and 3818.11 J/m^2 respectively. Analysis shows an increasing trend of erithemal UV doses (11.52 J m^{-2} per year). Considering heat waves, number of tropical days, anomalies of maximum temperatures and erithemal UV doses the conclusion is that the most hazardous summer regarding the human health in Novi Sad was in 2000, 2003 and 2007.

Key words: tropical days, heat wave, erithemal UV dose

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FIFTY YEARS AFTER THE DISASTER OF ZAVOJ LAKE

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Abstract: At the end of 1963, a large mass of earth and rocks that moved down slopes on the right valley side of the Visočica River, the tributary of the Nišava River, at the southern foothills of Stara Planina (Old Mountain) close to the town of Pirot, dammed the Visočica River. After only a few days, a lake 7.2 km long and 33.15 m deep was formed. The lake flooded fields, roads, houses, house plots, as well as school and church in the village of Zavoj, whose population was displaced. Given that similar disasters have never occurred before in Serbia and wider region, this one has attracted attention of geographers, geomorphologists, geologist and practicing hydropower professionals. After massive works that were carried out over a thirteen-year period, a modern concrete dam was built on natural dam behind which a reservoir (lake) 16.35 km long and 60 m deep was created at an elevation of 612 m above sea level. Today, water from the lake is used for the production of electric power in the ”Pirot” Hydroelectric Power Station with an installed capacity of 40 MW. Fish was stocked several times, so that the lake attracts fishermen. Weekend houses have been built along the lake riparian area. The lake is connected to Pirot by an asphalt road. The dam is, at the same time, also a bridge connecting the two valley sides of the Visočica River. The creation of lake has caused certain changes in space.

Key words: landslide, dam, lake, tourism potential

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SPATIAL AND TEMPORAL DISTRIBUTION OF GEOPHYSICAL DISASTERS

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Abstract: Natural disasters of all kinds (meteorological, hydrological, geophysical, climatological and biological) are increasingly becoming part of everyday life of modern human. The consequences are often devastating, to the life, health and property of people, as well to the security of states and the entire international regions. In this regard, we noted the need for a comprehensive investigation of the phenomenology of natural disasters. In addition, it is particularly important to pay attention to the different factors that might correlate with each other to indicate more dubious and more original facts about their characteristics. However, as the issue of natural disasters is very wide, the subject of this paper will be forms, consequences, temporal and spatial distribution of geophysical natural disasters, while analysis of other disasters will be the subject of our future research. Using an international database on natural disasters of the Centre for Research on the Epidemiology of Disasters (CRED) based in Brussels, with the support of the statistical analysis (SPSS), we tried to point out the number, trends, consequences, the spatial and temporal distribution of earthquakes, volcanic eruptions and dry mass movements in the world, from 1900 to 2013.

Key words: geophysical disasters, statistic analysis, earthquake, volcanic eruptions, dry mass movement

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ROCKFALL HAZARD IN GREECE

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Abstract: The geological structure of Greece (frequent occurrence of rock formations, existence of faults and fracturing of rocks), the steep topography and mountainous terrain as well as its high seismicity, creates a significant rockfall hazard. The rockfall hazard poses a high to very high risk to transportation infrastructure, inhabited areas, archaeological and national heritage sites. During the last decade, a number of rockfalls have been triggered due to significant earthquakes, for example that of Skyros (2001), Lefkada (2003), Achaia (2008) and other. Older rockfalls due to seismic triggering have occurred during the Alkyonides (1981) and Kalamata (1986) earthquakes. A rise in rockfalls has occurred during the recent years (2010-2011) due to heavy rainfall as proved by the incidents in Tempi, Tithorea and other. The paper presents a rockfall susceptibility map of Greece based on the a number of factors, namely: a) slope, b) lithology, c) distance to faults, d) rainfall, e) seismicity. A susceptibility map for each factor was produced using GIS. Finally a rockfall susceptibility map of Greece was produced using a GIS-based parameter rating approach. Based on the susceptibility map, the areas with high susceptibility to rockfall are selected and case studies for each area are presented from known rockfalls that have occurred in Greece in the past 15 years..

Key words: rockfall, hazard, earthquake, GIS, Greece

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DEBRIS FLOWS IN KAZANLAK VALLEY, SOUTH SLOPES OF THE BALKAN MOUNTAIN RANGE, BULGARIA

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Abstract: Along the Balkan fence of Kazanlak valley have active debris flows. They are formed in little basins (to forth order, after Strahler, 1952) and increase the relief-dissection rate. Their activity is related with deforestation of this area, especially strong during the end of the Medieval period. The fortification of the streams along the south slope of the Balkan Range was a state policy when a Department of Forestation was found (as department of the National Agency for Torrents Control) in 1904 in Kaznalak town. This research was taken during archeological excavations, when layers stratification around Thracian moulds showed typical alluvial fan gradation. The aim of this study was to characterize the streams, their type, their deposits and their forms of accumulation (using grain size analysis), and to estimate the forestation as prevention activity. The results showed that debris flows in Kazanlak valley are incoherent, the size of their sediment's forms is not large but they are very sustainable.

Key words: Kazanlak valley, colluvial fan, debris flow, erosion, forestation

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HYDROLOGICAL RISK PHENOMENA FROM SOUTH-WEST PART OF ROMANIA (1912-2012)

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Abstract: The study of hydrological risk phenomena involves a wide range of issues, which should start with the climatic and hydrological data and should end with the monitoring of the risk factors, in order to pass from the diagnosis analysis to the prognosis one. We intended to draw up such a comprehensive study as well because it combines the classical methodology (field research, deductive, inductive, historical methods) with the specific methodology of the Geographical Informational Systems (G.I.S.). To analyze the hydrological phenomena on the basin, we used the climatic and hydrological data collected on the field from 6 meteorological stations and from 5 hydrometric stations. The floods occurred on the rivers from the Banat region constitute a frequent natural phenomenon. Their analysis on a period of 100 years (1912-2012) reveals that the regularity of the major floods is approximately 30 years. There are also cases when these phenomena happen at only a few years, as is the example of the floods occurred in 2005 only five years from the ones from 2000. The historical data confirm the occurrence of the catastrophic floods which influenced the economic life of Banat and which occurred in chronological order from 1912 until 2012.

Key words: floods, hydro technical works, causes, effects, damages.

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REGIONAL AND TEMPORAL DIFFERENCES OF DROUGHT HAZARD IN THE SOUTHERN PART OF THE CARPATHIAN BASIN

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Abstract: Drought is the most serious environmental hazard in the southern part of the Carpathian Basin. Drought indexes were calculated by the Palfai method on the southern part of Hungary and the northern part of Serbia. During the analysis the spatial (meso-scale level) and temporal (the basic period was 1961-1990) effects of changing drought extremes were investigated. The study indicates the magnitude of the drought hazard for the periods of 2021-2050 and 2071-2100 (using REMO and ALADIN model simulations), assuming the A1B emission scenario. The same database and the same model were used to the calculation of the drought hazard in the Hungarian and Serbian areas. Using these results the most vulnerable areas were identified. The results give orientation about the prospective droughts, moreover entrances of adaptive measures to solve problematic and risky developments by developing types of optimal land use for the usage in spatial and water management planning. The scenario maps of landscape vulnerabilities (with overlapping the actual landuse/land cover maps and the surfaces sensitivity) will help to clarify the adaptive capacities.

Key words: Drought hazard, Palfai index, southern Hungary, northern Serbia

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SUMMER AIR TEMPERATURE VARIABILITY AND TRENDS WITHIN OLTENIA PLAIN

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Abstract: The interannual and decadal variability and trends of summer (June to August) air temperature over the Oltenia Plain area is analysed for the period 1961 to 2010. The datasets cover monthly temperatures from six meteorological stations. Linear regression and the non-parametric Mann-Kendall test are used to discover any trends present in the datasets. As expected, the most significant trends found for temperature mark increases of up to 0.5°C. From the temporal variations, a dramatic increase in temperature is observed particularly in the last two decades. This enhancement of average temperature is strongly consistent with the results of present studies made in Europe, warming being mainly attributed to an increase in anthropogenic greenhouse gases. From the spatial distribution viewpoint, most stations behave quite similarly, indicating that the increasing trends are linked to large-scale rather than local processes. The analysis of temperature during distinct seasons is quite important as different seasonal warming rates may have important consequences for natural vegetation, agriculture, human health, and energy consumption, amongst others.

Key words: air temperature trends, Mann-Kendall test, Oltenia Plain

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NATURAL AND TECHNOLOGICAL HAZARDS IN BULGARIAN DANUBE SECTOR FROM VIDIN TO NIKOPOL

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Abstract: Investigations of the natural hazards are one of the most important parts in the present scientific works. The problems are related with different theoretical. methodological and practical aspects. The region of the Lower Danube is one strongly affected region in Europe related with different natural and technological hazards. The current research covers only part of Bulgarian sector of the river Danube. The most intensive are geological and geomorphological hazard along the Danube shore. The hydrological hazards are related with high Danube levels and affected the regions with lowlands around Vidin, Archar, Orsoya etc. The climatological hazard is represented with extreme parameters of the temperature, rains and wind and some no temporal .phenomena as hails, blizzards etc. The technological hazards are presented with analysis of the waters and soil quality. The part of them is result of anthropogenic activities in the region and also of the transborder migration of different pollutant.

Key words: natural hazard, technological hazard

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POSTSEISMIC PHENOMENA AND CONSEQUENCES OF KRALJEVO EARTHQUAKE

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Abstract: The Municipality of Kraljevo is positioned in the central part of Zapadno Pomoravlje and represents area of complex geological and geomorphological composition. The earthquake measuring 5.4 on Richter magnitude scale hit Kraljevo on the 3rd of November. It affected Kraljevo and parts of the neighbouring municipalities (Čačak, Vrnjačka Banja, Kruševac and Raška). The hypocenter was 13 km deep, while the epicenter was located 4 km northern from Kraljevo in village of Sirča, on 8 km long fault line. The consequences of the earthquake were numerous. The great fear among citizens, structural damage on buildings and seismodynamic deformation of the terrain are considered as main consequences. The seismic deformations occur in Zapadna Morava alluvial plain. The most notable deformations are: cracks in soil, red and gray hot sand ejection from cracks and formation of mud holes and craters in epicentral area of Sirča.

Key words: Kraljevo, earthquake, epicenter, Sirča, postseismic phenomena

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THE CAUSATIVE-EFFECTIVE LINK BETWEEN PROCESSES ON THE SUN AND FOREST FIRES NEAR TREBINJE (BOSNIA AND HERZEGOVINA) IN THE PERIOD MARCH-SEPTEMBER 2012

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Abstract: From late March to early September 2012 there have been several cases of forest fires near Trebinje, that is, eastern Bosnia and Herzegovina. Having an insight into official data of relevant institutions, we looked at the specific locations where the fires broke out, potential causes and the amount of damage. Bearing in mind that at the same time the fires occurred on wider area, we tried to test the heliocentric hypothesis in these examples, too. It turned out that in all concrete cases, immediately before the occurrence of fire, a coronary hole and/or energy region was in the geoeffective position on the Sun. Instruments on satellites recorded sudden influxes of charged particles a few days earlier, which according to the hypothesis may represent a potential explanation for the initial phase of the flame. Analysis of synoptic maps has also confirmed previously proposed model, in which the Balkan Peninsula during the summer is mostly under the influence of air masses coming from the northwest and/or southwest. With a deeper penetration to the ground, the magnetic layer of the jet stream suffers increasing resistance. At one moment it opens in such a way that protons are scattered to the left under the principle of left coil, and electrons right in relation to the main direction of the jet stream. Timeline of events has shown that in these cases by the end of March and beginning of September 2012, burning of biomass by charged particles can be a potential explanation.

Key words: forest fires, heliocentric hypotesis, eastern Bosnia and Herzegovina

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