CONFERENCE

ON WATER OBSERVATION AND INFORMATION SYSTEM FOR DECISION SUPPORT

2008

ABSTRACTS

27-31 May 2008
Ohrid, Republic of Macedonia

“Water is the driving force of all nature”

da Vinci

Balkan Institute for Water and Environment, Montpellier, France
Faculty of Civil Engineering, University "Sts.Cyril&Methodius", Skopje, Macedonia
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BALWOIS

Welcome to BALWOIS 2008

Welcome to BALWOIS 2008, the third International Scientific Conference on Water Observation and Information System for Decision Support, held in Ohrid, Republic of Macedonia, from 27 - 31 May 2008 (Hotel Bellevue).

On behalf of the Scientific and local Organising Committees, it is a great pleasure for us to invite you to attend the BALWOIS 2008 which is patronized by the Ministry of Environment and Physical Planning of Republic of Macedonia and by the French Embassy in Skopje.

BALWOIS 2008 is supported by Ministry of Ecology and Sustainable Development and Planning of France, International Association of Hydrological Sciences (IAHS), UNDP (Macedonia) and the following companies: BENTLEY, ESRI–GISDATA Macedonia, KISTERS, VAISALA, SEBA and NEVANTROPIC.

The main organizers are Balkan Institute for Water and Environment (IB2E), Hydrobiological Institute of Ohrid, Faculty of Civil Engineering ("Sts. Cyril and Methodius" University – Skopje), University "St.Kliment Ohridski" – Bitola, Remote Sensing Application Centre (ReSAC, Bulgaria) and Macedonian Association of Meteorology (METEO MAK).

The transboundary shared waters (rivers, lakes and groundwater tables) of Balkan Peninsula make this area an earth of challenges for applying the well known concept of Integrated Water Resources Management in a context of regional climate changes and anthropogenic pressures on environment.

The key objectives of BALWOIS project are to improve the scientific knowledge and the networking between the scientists, to favour a multidisciplinary approach and to disseminate reliable and suitable information products to the end-users in order to reach the health and protection of the populations and to preserve the biodiversity of the aquatic ecosystems.

Three main actions are carried out in BALWOIS project:

(i) the creation of a network of scientists and stakeholders working in water related fields,
(ii) the implementation of a Water observation and information system, and
(iii) the organization of working groups, workshops, scientific visits, training courses and significant scientific events.

BALWOIS bring together more than 800 members - water field's experts - from around 100 institutions of which 80 belong to Balkan Peninsula.

The Water IS is made of information on the main stakeholders and knowledge on water and environment related issues in Balkan in free access (conferences proceedings, reports, hydrometeorological data, expert's database, etc.).

As main of scientific events, BALWOIS 2008 is aimed to provide at international and more specifically at Balkan levels:

- a meeting that will further the progress of the knowledge in the fields of Scientific research, Education, Policy and Development Activities and on all the Water related issues related to climate changes, hazards mitigation and water resources assessment, management and protection,
- an atmosphere to enhance the links between the providers and the end users of water related knowledge,
- a forum for free discussion of new ideas, research, development and applications, including techniques and methods to stimulate future works,
- an exhibition of current hardware and/or software in the field of water,
- opportunities for students and young researchers and engineers to meet their experienced peers and to stimulate them to join BALWOIS activities, and
- new knowledge through the publishing of high quality papers on BALWOIS web site and through DVD bundle, books edition, etc.

Ohrid is one of the most welcoming towns of Republic of Macedonia with a very significant cultural heritage. Nobody would contest that Ohrid Lake - 358 km², several millions years old and surrounded by splendid Macedonian and Albanian mountains - is among the most beautiful lakes of Europe. Together Ohrid and Prespa lakes and their environments offer a large biodiversity with endemic species.

In this document are presented 395 abstracts coming from 45 countries and accepted by the Scientific Committee.

Among the 285 full papers received, more than 200 are presented during the Conference on 8 topics related to:

- Climate and Environment
- Hydrological regimes and water balances
- Droughts and Floods
- Integrated Water Resources Management
- Water bodies protection and Ecohydrology
- Lakes and Wetlands
- Hydrological modelling
- Information systems and technologies

After the conference, working groups will be setup for writing recommendations, synthesis studies and educational products based on all papers collected during the conference.

I would like to thank sincerely for their work and their support the members of the committees, our sponsors and all staff who contribute efficiently to the success of this event that is starting to be a traditional event in Balkan.

I am sure that you will enjoy your stay in Ohrid, its tourist charms and of course, the scientific programme of the Conference.

Welcome to BALWOIS 2008 !

Marc Morell, BALWOIS Coordinator

Cvetanka Popovska, BALWOIS Scientific Committee

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WATER IS OUR MOST IMPORTANT NATURAL RESOURCE. WE MUST SUCCEED IN PRESERVING IT.

THE NUMEROUS ABSTRACTS IN THIS BOOK ARE PROOF THAT WE ARE IN A RIGHT DIRECTION.

Sonja LIPITKOVA

Dep. MINISTER,

MOEPP of Rep. of Macedonia

CONTENTS

TOPIC 1

CLIMATE AND ENVIRONMENT

003 - CLIMATE RISK MANAGEMENT IN NORTH-EAST OF IRAN BY STATISTICAL DOWNSCALING DIRECT ON GCMS OUTPUT

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In climate change studies the global circulation models of Atmosphere (GCMAs) enable one to simulate the global climate, with the field variables being represented on a grid points 300 km apart. Unfortunately, the most recent generation of general circulation models (GCMs) still has serious problems when modeling over Iran. However, these models are able to reproduce the main patterns of atmospheric circulation, such as those derived from a principal component analysis of the sea level pressure anomaly field. GCMs Models are benefit for detecting Climate change and zone on a special parameter. Even if global climate models in the future are run at high resolution there will remain the need to -downscale- the results from such models to individual sites or localities for impact studies.

A Statistical Model (SM) has been developed to downscale large scale predictors given by Global Climate Models (GCMs). This is a complementary approach to the dynamical modeling of regional climate change using high resolution nested models. It allows bridging the scale difference (-downscaling-) between coarse grid Coupled Atmosphere-Ocean GCMs and the finest temporal and spatial scales required for regional and environmental impact studies of climate change General Circulation Models (GCMs) indicate that rising concentrations of greenhouse gases will have significant implications for climate at global and regional scales. Less certain is the extent to which meteorological processes at individual sites will be affected. So-called -downscaling- techniques are used to bridge the spatial and temporal resolution gaps between what climate modelers are currently able to provide and what impact assessors require. Many downscaling techniques have been developed in recent years, all having in common the need to establish statistical links between the large-scale circulation and the observed data at a local or regional scale.

We know several centers in the world are producing climate data in deferent scenarios. So, choose the best one that is suitable in selection area and then use them for detecting change in climate parameters is the main propose of this paper. In this paper, we try to find correlation between observed data and models outputs to find the best one for downscale daily Data over the North-East of Iran. We use SDSM tools for that changing scale. It was found that the Temperature (Min, Max) and Precipitation characteristics (mean, variance, and

empirical distribution) were better reproduced by the downscaled results than by the GCM direct output. With using Data constructed for the future (2010-2039) in SPI (Standard Precipitation Index) we could detect climate change in this region for future and it will improve climate risk management.

Keywords: Climate Change, Downscaling, GCM, Risk Management, SDSM.

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009 - CURRENT RAINFALL NETWORK LEVEL OF TURKEY

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Turkey has a variety of climates, changing from the temperate climate ofthe Black Sea region to the continental climate of the interior, then tothe Mediterranean climate of the Aegean and Coastal Mediterranean regions. It has a surface area of 779 452 km².

Turkey is divided into 26 river drainage basins to study the water and land resources asextensively as possible. Rainfall observations are made mainly byTurkish State Meteorological Organization (DMI), Turkish State Hydraulics Works (DSI) and General Directorate of Agriculture Research(TAGEM) (former General Directorate of Rural Service (GDRS)). Turkish State Meteorological Organization (DMI) is the sole responsible for the meteorological network and weather forecasting of Turkey. Some more state organizations such as agricultural research institutes, state farms, forest ranger and highway maintenance units, and university research laboratories also make precipitation observations but they are local and continue for a limited period of time and after completion of the work the results are transferred to DMI.

DSI started in 1956 to operate rainfall observations by Hellmann type pluviometers at their meteorological stations and at present DSI operates rainfall observation stations which are located mainly at upper reaches of the reservoirs watersheds. DSI has also meteorology stations which are used both for rainfall and evaporation

observations. DSI Meteorology stations are equipped with Bellfort weighing type of pluviographs, Hellmann type pluviometers, Class-A type evaporation pans and Mount Rose type snow samplers. Additionally automatic meteorological stations which are located at TEFER project area transfer observation data to the central operation office at Ankara by telemetric system. General Directorate of Agriculture Research-TAGEM (former GDRS) has 12 Agricultural Research Institutes in Turkey. At each research institute, there are well monitored small representative basins, to improve the yield and quality of irrigated crops through the design of efficient management systems. For these purpose TAGEM operates meteorological observation stations at these research basins to collect the necessary climatic data including rainfall, the collected data is shared by DMI. In data analysis for the elimination of errors, percentile, normal-ratio, double mass curve methods and correlation techniques are employed by all the data collecting organizations. The error free data can be purchased from the organizations. In this paper, a detailed survey of current situation of Turkish rainfall observation network, rainfall measuring instrumentation and the methods used in the analysis of rainfall data are presented.

Keywords: Turkey, Rainfall Observation network, instrumentation, automatic observation

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012 - A REGIONAL CLIMATOLOGY OF BLOCKING OVER ATLANTIC OCEAN AND EURASIA DURING 1996-2005

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In this paper we investigate the climatology of blocking as an extreme weather system which has noticeable effects on weather and climate. This phenomenon

usually is accompanied by extreme events like drought and flood provided that it last for more than 1-2 weeks. One example is intense snow falling in vast parts of Iran especially in Rasht and Tehran associated with a dipole block remained immovable over north of Black sea and Eastern Europe. In spite of extensive studies done to understand dynamics and physical mechanisms of blocking events, no general idea has been adopted. Climatic aspects of blocking give some interesting results which guide us to perceive how this event can identify weather and climate of dominated regions. In this research, a regional climatology of blocking over Atlantic Ocean and Eurasia during 1996-2005 has been done. Some recent investigations studied climatology of blocking in the north hemisphere. However, regional climatology of blocking in the mentioned region will be obtained new results in details.

The dataset used in this study is the National Centers for Environmental Prediction-National Center for atmospheric Research (NCEP NCAR) gridded reanalyses. The 1200 UTC NCEP NCAR reanalyses used here for the calculations are the 500-hPa gridded (2.5°×2.5°) heights from January 1996 to January 2005. By using a zonal index, we detected blocking events with additional information like blocking center, extension, duration and intensity. Intensity of blocking is a measure that shows the ability of blocked flow to deviate normal flow in 500-hpa level from zonal to meridional.

According to this study, a total of 149 blocking events were detected in this region, giving an annual average of about 10 events. Longitudinal distribution of blocking frequency was obtained three picks with main pick in about 30°E over Eastern Europe. Decreasing of blocking frequency in western Atlantic Ocean and eastern Asia indicates the fewness of occurrence of blocking events in regions which are the origin of intense storms and strong zonal flows according to recent studies. Longitudinal distribution of blocking intensity has a wide maximum over western Atlantic Ocean. This feature may be linked to sea level pressure and temperature over ocean. Seasonal distribution of blocking frequency shows more events in spring and winter, however, blockings are more intense in winter and autumn. Likewise blocking events happened in summer were more frequent in Siberian region and those occurred in winter was related to Atlantic Ocean (western). Latitudinal distribution of blocking centers exhibit that the blocking anticyclones concentrated within the 50°N-60°N band. Also, this location moved poleward in summer and equatorward in winter. According to aforementioned results, weather of Eastern Europe and Middle East experienced blocking systems frequently; however, seasonal and geographical distribution of blocking frequency and intensity were different.

Keywords: Blocking, Drought, Flood, Dipole Block, Zonal Index, Storm, Strong Zonal Flow

013 - TEMPERATURE AND RAINFALL FLUCTUATION : A CASE STUDY OF UDIGRAM, SWAT VALLEY, NORTHWEST PAKISTAN

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A study of temperature and rainfall fluctuation of Udigram, Swat, reveals decrease in annual rainfall during the past 15 years. As a result climate has become sub-humid in 2000, as compared to the humid in 1980. The valley receives both summer and winter rainfall, but the annual share of winter rain is higher than summer season. January is the coldest month when the temperature falls to freezing point, and June is the hottest month when the temperature exceeds 30 degree Celsius. There are four rainy seasons i.e. winter, pre-monsoon, monsoon, and the post monsoon. The temperature of the valley increases at the rate of 1oC per year since 1998. The summer rain showed little decrease, whereas the winter rainfall declined at the rate of 5cm per year during the past six years since 1995. If the rainfall of the valley decrease at this rate, then the climate of the area will be semi-arid by 2020. This climatic fluctuation may be the result of the changes in the air pressure, wind speed and direction, and deforestation on global level, and the Gulf-Afghan crises. However, due to rapid increase in temperature and decrease in pressure, it is estimated that this reduction in winter rains of the area will be recovered upto 2005.

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019 - HARNESSING WATER RESOURCES IN THE NEXT CENTURY FOR BANGLADESH AGRICULTURE

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Water is an essential component of sustainable agriculture. Rainfed agriculture in Bangladesh is risky, while irrigation is expensive but profitable. Quality irrigation

water is a scarce resource during the dry season. Efficient irrigation technologies should be used/ developed to make best use of this resource. Rice cultivation requires a huge quantity of water. Therefore, the number of rice crops in a pattern should be reduced and substituted with other economically important crops. If more environment friendly irrigation techniques and crop types are given a higher priority, water use could be dramatically reduced, resulting in more sustainable development.

Keywords : Water, Agriculture, Rainfed agriculture, Irrigation

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024 - ROMANIA'S WESTERN PART (TIMIS COUNTRY) BETWEEN HUMIDITY EXCESS AND WATER SCARCITY. THE FUTURE OF DRAINAGE ARRANGEMENT AND WET AREAS

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Romania's territory is under the influence of 3 hazard types (geomorphologic, hydrologic and climatic) with direct influence upon soil humidity. Soil humidity excess affects in Romania more than 8.5 million hectares (4 million hectares affected by temporary humidity excess from precipitations, almost 2 million hectares with permanent humidity excess caused by high water-table level, and about 2.5 million hectares with humidity excess from water courses infiltrations or caused by flooding) from which about 52% requests direct measures of drainage.

Drainage measures where applied in Romania beginning with the ancient period, but arrangements at large scale were realized starting with the XVIII century. After 1944 started the "golden age" of hydroameliorative works, in Romania being practiced an intensive drainage on large areas with positive, and, in the last years, with negative impacts upon soil fertility.

Until few years ago, an important part of Timi- County was affected by humidity excess of different types. As a consequence were designed and installed many drainage and surface drainage arrangements which worked intensive, during the

drought periods being created perfect conditions for most of the crops.

In the last years the situation has changed. The climatic changes together with the significant decrease of water table (result of intensive drainage) impose in the drought periods to be applied irrigation in order to assure proper conditions for agriculture. The combination intensive drainage - climate heating presents negative impact and upon wetlands.

During the last years, as a consequence of land reclamation and improvement works activity (especially of surface drainage works) corroborated with the increased frequency of droughty years, in the perimeter of Timi- County's wetlands appeared a water deficit. This phenomenon encouraged a fast mudding which generated the possibility of open water surfaces by vegetation and the water quality degradation. The impacts are visible upon trophic chains.

This paper will present the actual situation in Romania's Timi- County (about 8800 km²) regarding soils humidity and the climate heating and will provide an image regarding the future of hydroameliorative works and their impact on the environment.

Keywords: drainage, humidity excess, climate heating, deficit, wetlands, impact

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025 - EFFECTS OF PHYSIOGRAPHIC FACTORS AND SOME HYDRO-PHYSICAL SOIL PROPERTIES ON RIVER FOLLOW IN ULU DERE CATCHMENT

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This research was carried out in Ulu Dere catchment located in Çankiri-Yapraklı-district of the Central Anatolia. The objective of this study was to investigate physiographic parameters, some hydro-physical soil properties and land use on river follow in Ulu Dere Catchment. Some physiographic factors and land use-land cover were determined and evaluated by using RS-GIS program. Ulu Dere catchment is about 24.3 km². Georeferenced Landsat Thematic Mapper data were classified to identify land cover and land uses of the study area. According to classification results, the most common land use types are forest and degraded

forest lands (74.9%), pasture and degraded pasture lands (17.4%), agricultural land (rainfed and irrigated cultivated lands) (7.1%), and settlement (0.6%).

The study area consists of various topographic features (flat, hilly, rolling etc.). Mountains, hilly and rolling physiographic units are particularly common in the study area. 16.2% of the study area has less than 20 % slope (gentle and moderate) and 83.8% has more than 20% slope (steep and very steep). Mean sea level altitude of the catchment is 1000.5 m. Average annual precipitation and temperatures are 530.8 mm and 9.1 °C, respectively. After examination of topographic, land use-land cover, geologic and geomorphologic maps and land observation, 6 soil profile places were excavated and described in the study area. According to physical, chemical and morphological properties of soils, they were classified as Typic Xerorthent, Lithic Xerorthent, Typic Haploxerept, Typic Dystroxerep and Lithic Haploxeroll.

Keywords: Physiography, land use-land cover, hydro-physical soil properties

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036 - SPATIAL INTERPOLATION OF PRECIPITATION ON THE CETINA RIVER CATCHMENT

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This study deals with the spatial estimation of the storm precipitation in the Cetina River Catchment. The river is 105 km in length and completely flows through Dalmatia, the Croatian south region. The River catchment is a highland area of about 4142 km², divided by the Dinara mountain into two parts. The western part has area of 1721 km². It is -direct" or topographic catchment, almost entirely situated in Croatia, while climate is under strong influence of the Adriatic Sea. The eastern part of catchment (2421 km²) is referred as the "indirect" catchment. It is mainly situated in Bosnia and Herzegovina, with continental climate. Therefore, precipitation regime is very complex and variable over catchment area.

From the year 1988 four storms were analysed. Daily measurements were used to calculate total amount of precipitation for each storm. Each of them has the duration of 2 - 3 days.

Ten rain gauges on the "direct" part and eleven rain gauges on the "indirect"

part were taken into account. These two parts were analysed separately due to different precipitation regimes.

A few conventional methods (arithmetic average, Thiessen method, inverse square distance method, hypsometric method and isohyetal analysis) were used to calculate average precipitation on the each part of catchment, while geostatistical methods (ordinary kriging, universal kriging and kriging with external drift) were used to calculate precipitation maps and statistical accuracy.

The results of regression and geostatistical analysis have shown that two storms have spatial trends with NW direction. There is a storm where precipitation is related to the elevation. On the other hand, there is a storm almost without any trends. Furthermore, spatial distributions of storm precipitations could be considerably different on the "direct" and the "indirect" part.

Keywords: Cetina River, precipitation, geostatistical methods

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046 - RAINFALL INFLUENCE ON IRRIGATION WATER CONSUMPTION IN STREZEVO IRRIGATION SYSTEM

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In this paper it will be explored the influence of the rainfalls with different durations and intensities on irrigation water consumption of some main irrigation pipelines of Strezevo Irrigation System during the watering season.

For this research, hourly records of rainfalls from Bitola Weather Station and respectively hourly records of irrigation water consumption of couple neighboring main irrigation pipelines of Strezevo Irrigation System are available for a period of 12 years.

From this research is also expected to confirm some opinions about farmers' bad irrigation practices in Strezevo Irrigation System.

Keywords: rainfalls, irrigation water consumption

049 - WATER YIELD AND SEDIMENT DISCHARGE FROM A DECIDUOUS FOREST ECOSYSTEM IN ISTANBUL-TURKEY

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The objectives of this paper are to present annual water yield and sediment loss from a forest ecosystem consisting of completely natural broadleaved old growth oak-beech stands and to show precipitation, streamflow, and sediment discharge trends over time.

An experimental watershed has been monitored since 1979 for streamflow and suspended sediment discharge. Data presented in this paper covered a period of 17 years. Streamflow in the watershed has been recorded with an automatic water level recorder in a 90° concrete sharp-crested V-shaped notch weir.

Precipitation data were taken from nearby Bahçeköy Meteorological Station of State Meteorological Works. Water grab samples from streamflow were collected on a weekly basis and analyzed on the same day of collection for suspended sediment.

Results show that there are great variations among the years for water yield and sediment loss. Average annual precipitation, water and sediment yields are 1042,6 mm, 212,37 mm, and 417,14 kg/ha and their coefficient of variations are 22%, 87%, and 66%, respectively.

Keywords: Water Yield, Sediment Discharge, Streamflow, Time Series, Broadleaf Vegetation, Watershed Study.

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055 - CLIMATE VARIABILITY AND THE TREND ALONG WITH THE DRINI RIVER IN ALBANIA

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This paper presents the analysis of climate variability and trends in the northern

part of Albania located alongside of Drini River. Independently its small area, because of broken relief, a considerable variability of climatic elements inside this zone does exist. There are two main factors that create this variability: altitude over sea level and distance from the sea.

The study considers the long term series of temperature, precipitation, snow, and wind for the period 1951-2004. To provide the evidence of their variability, the trends of anomalies related to the normal values (1961-90) are analyzed.

Some conclusions are drawn related the climate variability and the trend:

- Annual mean air temperature presents a considerable variation. It varies from 8.9°C in inner part of the zone up to 15.4°C in mouth of the Drini River, Lezhe, while on the whole the mean of this zone is 11.7°C. It indicates a positive trend of about 1.0°C for the entire zone
- Annual distribution of mean, max, min temperature has similar cycles, the maximum value realized in summer (July-August) and the minimum in winter (January).
- Precipitation total presents a decreasing trend. The ratio of the yearly amount of precipitation over the long term average decreased from 1.2 in the 1961 year to the 0.8 in the 2000 year.
- The mean speed of wind on the whole zone varies from 1.6 up to 3.7 m/sec. The high value of the wind speed came across in the hilly part as well as on the mouth of the Drini River, Lezhe. During the year the maximum values of mean speeds came across during the cold period where they reach up to 5.4m/sek during the January, Lezhe.

Keywords: air temperature (anomalies and their trend), precipitation and the trend, mean speed.

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056 - WEATHER HAZARDOUS PHENOMENA ALONG WITH THE DRINI RIVER IN ALBANIA

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One of the greatest problems nowadays is becoming natural disasters. All the countries are affected and all the activities are suffering from these phenomena.

For that reason in order to meet these adverse weather phenomena based on the statistical methodology the following elements as: Heavy rain (intensity and amount), Maximum and Minimum Absolute Temperature, Strong winds (wind roses), Snow (maximum snow depth and number of days) have been analyzed in our paper.

In the threshold calculation for adverse weather phenomena identification we shall use the frequency distribution of meteorological variables.

Referring to the result we can draw some conclusions:

The central and western part of this zone is characterized by high values. The amount of 24 hours precipitation in Lezha station recording in September 2002 of 368.7 mm remain the highest value in all yearlong series of September months starting since 1951.

Taking in consideration the threshold >35°C for the entire zone the bigger number of days are observed in the low altitude and the minimum one in the high altitude. Regarding the minimum absolute temperature, they vary from 10°C in the down stream of Drini River in Lezha, up to value 23.4°C recorded in Dega station, which is the lower value observed in this zone.

Weather elements, which become adverse when it reaches extreme values is the wind. In Lezha station the maximum wind speed have reached value 40 m/sec.

The wind speed becomes dangerous for human activities when it is greater than 15 m/s.. The highest value of the cases with wind speed more than 15m/sec (63 cases) is recording in Lezha and Puka (1983).

The snow depth is another climatic element which can become an extraordinary event when it reaches high values. Taking into account that the mostly of this zone is highland, this phenomena is present every year.

Based on the statistical method the snow depth over 0.5 m is choosen as threshold for calling this element dangerous.

The maximum snow depth and the days with snow higher then 0.5m for each year are analyzed. Analyzing the result we find out that after year 1976 the dangerous days by snow depth almost do not exist with exception the year 1985 when the snow depth reaches the height about 150 cm and the number of snow days reached up to 16 days.

Keywords: precipitation (intensity and amount), strong wind, max and min absolute temperature, snow depth.

057 - EFFECTS OF GLOBAL CLIMATE CHANGE ON AGRICULTURE AND WATER RESOURCES

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It is accepted that one of the most important environmental problems of the present century will be climate change. This will give rise to changes in weather patterns, and an increase in the frequency and severity of extreme events such as flooding and drought. In Turkey as in the rest of the world, global climate change will be cause an increase in the severity and frequency of heat waves, sea level rise, and extreme rainfall and flood events in some regions but increased drought in others, in a way that will directly affect living conditions.

In a study of 87 countries by the WMO, Turkey was one of 74 countries affected by drought. According to various climate models, the East Mediterranean Basin and the subtropical zone which includes Turkey will be experienced a reduction in rainfall especially in winter, but with changes in the duration and severity of rainfall, both flooding and drought are likely. At the same time, studies on water resources have shown that many catchment areas of the country experienced serious water shortages. Turkey is not rich in water. It has around 1500m^3 per person per year of available water amount, which is expected to fall down to 1000 m^3 per year with the climate change and the current rate of growth. As the largest user of water, the agricultural sector is expected to be affected by global climate change more than the other sectors. In this study global climate change and its impact on Turkey's agriculture and water resources will be evaluated.

Keywords: climate change, agriculture, water resources, Turkey.

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067 - ATMOSPHERIC CIRCULATION INFLUENCE ON THE EXTREME EVENTS OCCURRENCE IN THE DANUBE LOW BASIN

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In this study the extreme value theory is applied for studying daily maximum discharges incorporating as covariates indices of atmospheric circulation.

Orsova station, situated in the south-western part of Romania, was considered as representative in this analysis.

Two methods are applied for fitting the data to an extreme - value distribution: block maxima and peaks over thresholds (POT).

From the Generalized Extreme Values (GEV) analysis of the maximum daily discharges for one year, month or season, it resulted that these ones are fitted best to a Weibull distribution.

By testing through different methods the exceeding threshold (POT) for the daily annual discharges over the period 1900-2005, a value of 10000 mc/s was found. The values exceeding this threshold analyzed through Generalized Pareto Distribution (GPD) are well fitted by using a beta-type distribution.

In order to find the atmospheric circulation over Atlantic - European region influence on the occurrence of extreme events in the lower Danube basin the period 1958-2001 was analyzed (ERA-40).

The atmospheric circulation was fitted to the low frequency components of the decomposition in Multivariate Empirical Orthogonal Functions (MEOF). Then its influence was tested through incorporating in the GEV distribution parameters of the first 10 PCs of the MEOF decomposition simultaneously and with different month lags. The model presented the most significant improvement through introducing in the location parameter the first 10 MEOF's PCs of the atmospheric fields considered with one month prior to the occurrence of the maximum values in the discharge time series.

Therefore, incorporating the signal components of the atmospheric general circulation in the statistics of extreme events of discharges in the Danube lower basin led to an essential improvement of the statistical modeling of these events.

From this study we can conclude on the impact of climate change in the hydrological regime in Balkans zone, taking into account the capacity of Danube as pluviometry integrator in Europe.

The results obtained in this study represent a background for the estimation of climate change emphasis by the different scenarios model in comparison with observed data.

Keywords: EEOF decomposition, extreme value theory, GEV and GP distributions

069 - EVALUATION OF SOIL MOISTURE DISTRIBUTION IN DEPENDENCE ON CORN AGROTECHNICS

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The research was carried out in rye crops, "Danaya" growth, after a forerunner maize during 2006 - 2007 on leached soil (Pelic Vertisol) in the area of South-West Bulgaria. The experiment was treated with chlorsulfuron 7,5 g a.i. ha^{-1} + chlortoluron 2,25 kg a.i. ha^{-1} and was divided in two variants - the one was fertilized with N_0P_4, and the other - with N_8P_4. During the period of sowing (19.10.2006) till "the beginning of flowering" (16.05.2007) - 236 days, the total amount of precipitation is 120 mm; for the period "flowering - milky ripeness" (17.05 - 16.06) precipitation is 153 mm. The unsuitable climate conditions have different reflection on soil moisture distribution in both variants of research, especially during later phenophases of crops growth. Information indicators about moisture distribution are: moisture [%] in soil layer up to 5 cm and moisture gradient [%/10 cm] up to 50 cm. The equipment used is a special moisture detector with electrodes length 1,5 cm and two similar sounds with conductometric transducers, set in soil profile till "wax ripeness" of crops. The examined indices in both variants of crops are: density and height of stems, level of weed infestation and yield. Using data received from the experiment a discussion has been conducted about: influence of crops density upon soil moisture redistribution; factors influencing the drying process in different layers of soil profile, respectively - preservation of productive moisture.

The connection between different effectiveness of moisture exchange in roots soil layer in both variants and the agrotechnical activities applied for crops growth (weed infestation control and norm of fertilization) has been analyzed in accordance with yields received.

Keywords: soil moisture, moisture detector, conductometric transducers, drying process, productive moisture, yield

077 - ANALYSIS OF LAND USE EFFECT ON THE STATE OF EROSION IN DRAINAGE BASIN OF STORAGE

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The dam was constructed to support the development of the multi-functional storage, within the water management system. It was designed and constructed as rockfill dam with reinforced-concrete facing membrane on the upstream side. After dam construction, the storage volume was 12 000 000 m^3 and area 110 ha.

The study area presented in this paper is defined basically by the boundary of the Grliska Reka drainage basin upstream of the dam profile of the storage .

The conditions and characteristics of the drainage basin were studied and analysed based on the available documents, cartography and direct field investigations, the state of erosion processes was assessed and the erosion map of the study area was produced. The state of erosion processes and conditions prevailing in the same drainage basin in 1987 were evaluated based on the study of the available technical documentation (Main Design of Sediment Protection of the Storage Zajecar, 1987). The objective of this paper is to establish the causes of the recorded changes in the erosion intensity and sediment yield in the investigated area.

The study results show that the erosion intensity in the investigated area in 2006 was reduced compared to the state in 1987. This was manifested by the assessed state of erosion processes (mean erosion coefficient for the study area), and also by the calculated sediment yield, as the consequence of erosion processes, i.e. as the final act of numerous erosion factors.

Although the state of erosion processes in an area is the consequence of conditions prevailing in the area, i.e. the action of numerous factors, it was concluded that the changes in the state of erosion processes in the study area were almost exclusively related to the change of a few erosion factors, mainly included under the term "land use".

Land use is shown to be the principal modifyer of erosion intensity, i.e. the modifications in land use caused by the changes of human population in the drainage basin, resulted in the changes of erosion intensities.

Keywords: land use, erosion intensity, sediment yield.

080 - LOW FLOW ANALYSES FOR SELECTED BASINS IN THE REGION OF EAST AND SOUTH-EAST SERBIA

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In the framework of water pumps capacity research, critical flow quantities of rivers in the region of East and South-east Serbia were studied. Critical flow quantity was defined as 95% probability minimal monthly flow in the vegetation period (April-October).

Available monthly minimal flow data were taken from the Hydro-meteorological Service of Serbia observation network. A total of 13 basins were studied. Observation period duration was 22-27 years. All the data sets underwent statistical analyses. Duration curves for monthly minimal flows in vegetation period were calculated and drawn. For the basins where several observation stations along the river were studied, a successful correlation to the basin area was made.

One of the studied basins is a cross-border basin of the Nisava River, while a few others are in the vicinity of Bulgaria.

The study area and results are going to be mapped and commented.

Keywords: Low flows, Duration curves, Regional analyses.

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082 - EFFECT OF IRRIGATION ON YIELD PERFORMANCE OF CORN HYBRIDS OF VARIOUS MATURITIES GROWN UNDER VARYING CLIMATIC CONDITIONS

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Climatic conditions with uneven amount and variable distribution of rainfall

during growing season affect considerably yield performance and stability of crop production. Such conditions are present in the Vojvodina Province, Serbia, where droughts of various intensities occur in 80% of the years. Due to such conditions, crop yields are highly variable from year to year. This also stands for corn, which occupies around 40% of the total arable land.

Institute of Field and Vegetable Crops is engaged in mitigating effects of drought. In addition to irrigation, other solutions are tested, including the development of corn hybrids of different maturities but invariably high resistance to drought. New hybrids are tested each year, to be able to recommend most adapted hybrids for each production region possessing specific climatic conditions.

This paper presents the results obtained for a large number of corn hybrids regarding their drought resistance and effect of irrigation under varying weather conditions. Tests were conducted on a loamy soil in the period 2000-2007. Each year we tested 10 to 15 hybrids, which were grouped according to their maturity groups.

Of the eight test years, four were below average and the other four were above average regarding rainfall sum. The average rainfall for this region is 360 mm. In the test years, the lowest rainfall occurred in the year 2000, amounting to 149 mm, and the highest occurred in 2001, amounting to 714 mm. The years 2002 and 2003 were dry and the years 2004 - 2006 were moderately humid, with rainfall sums above the average. The year 2007 had an average rainfall, however, it was very unfavorably distributed and it was combined with high air temperatures. Maximum temperatures went up to 43-C, which negatively affected the relationship between potential water uptake and intensity of evapotranspiration of corn.

Because of low or unfavorably distributed rainfall, corn field had to be irrigated each year. Irrigation norms ranged from 60 mm in 2005 to 240 mm in 2003.

The average yield of irrigated corn was 12.90 t/ha, of non-irrigated corn 10.60 t/ ha. The effect of irrigation was thus 22%. The highest irrigation effect, 35%, was registered in 2003, when the largest amount of irrigation water was applied. In 2005, the single irrigation with 60 mm of water showed no effect whatsoever. Regarding the maturity group, highest effects were registered in the FAO groups 500 and 600, 24 and 20%, respectively, and lowest effects were with the groups 300 and 400, 16 and 7%, respectively. Early corn hybrids mature in late August or early September and they avoid effects of drought that almost regularly occurs in August. With the later-maturing hybrids, the irrigation practice increased the yield by about 1 t/ha. The non-irrigated late hybrids had fairly uniform yields.

083 - A CONTRIBUTION TOWARDS IDENTIFICATION OF CLIMATE CHANGES ASPECTS IN ALBANIA

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In the current circumstances the global climate is facing rapid changes due to the way how the humans are currently living, mostly in the developed countries i.e. economically healthy countries as in European Union and more widely. The evidently high rate of energy use for many purposes, industry and agriculture are directly influencing global climate to be changed.

In our paper, we wish to give a contribution through methodology approach based on the theory of Emberger and statistical relations.

Proccessed Data based on the temperature change and oscillations, for more than 30 years in the area of Tirana, show progressive tendencies, beside that the values are still low.

Based on the real climate indicators for a certain multi annual period like average temperature, average precipitation values, the data for micro zones taken into consideration the Q values are at the narrow ranges. The index Q based on Emberger, oscillated from 113.4 to 205.7.

From the data processed, the results from Tirana zone (the humid variant of bioclimatic) of the Q values are over 90.

The effects of changes are appeared to be as following:

- in the first decade of study period 1970-1980, the temperature presented via regression equation $y = 0.7364x + 10.18$, $R^2 = 0.1766$, where the monthly range is 0.7364 °C.
- in the second decade 1980-1990, the same relation shows that $y = 0.5448x + 11.576$, $R^2 = 0.0992$, where the monthly value is 0.5448 °C, and lastly
- in the period 1990-2000, the temperature shows the relation $y = 0.2941x + 13.18$, $R^2 = 0.0264$, where the monthly range is 0.2941 °C.

Keywords: Zone, Climate indicators, climate change, bioclimatic

091 - STOCHASTIC MODEL OF TIME-SPACE FLUCTUATIONS UNDER MODERN CLIMATE CHANGE

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All space-time fluctuations of any hydrological characteristic can be represented with the following main axes:

- seasonal fluctuation inside each year and on each station,
- inter-annual long-term fluctuations of different time scales on each station,
- space fluctuations of each year during long-term period and for all stations over the area.

Development of general space-time model includes three main consecutive phases of an aggregation and disaggregation of information:

- stage 1: aggregation inside of intra-annual time interval in different forms: averaging, summarizing, parameters of seasonal function;
- stage 2: modelling over the long-term period for each point (station) including the decomposition and extraction of homogeneous components of different time scale (interannual, decadal, centural) and determination of time model in stochastic (distribution function) or deterministic-stochastic (autoregression model) forms;
- stage 3: regionalization and spatial modelling inside of homogeneous regions.

Regionalization is based on the indexes of classification or similarity.

In modern changing conditions such indexes of spatial classification can be the dynamic properties of the extracted climate tendencies: their statistical significance, direction, form of tendency, its contribution, etc. Time series with the same main properties of climate tendencies can be combined into homogeneous region. Modelling inside of such homogeneous region can be realized in one of the following forms: averaging, isolines, parameters of space model.

Statistical methods and the particular tools have been developed for realization of each step of development of such joint model. Among them are:

- two parameters linear model of seasonal function as a number of relationships between averaged data for long-term period and data of each year;

- robust statistical methods for extraction of interannual, decadal, centural and other time-scale components from observed time series, which do not misrepresent the properties of fluctuations;
- application of new dynamic characteristics, which characterize abrupt climate change and other dynamic properties (period and amplitude of cycles, speed of increasing and decreasing of fluctuations and their durations, etc.);
- identification of random events and their generalization into the time model as probable distribution function (pdf) or time function for modeling and forecast;
- tool for classification and regionalization of climate change components, which takes into account a spatial correlation and threshold index of intersection of the same sites in each class;
- use of new hydrological characteristics and new methods for hydrological computations in modern changing conditions.

Application of developed approach and methods has been given for a joint modelling of annual runoff, precipitation and air temperature in the North of European Russia, European continent, and for hydrological computations in new conditions of modern climate change for different hydrological characteristics.

Keywords: stochastic hydrology, stationarity, homogeneity, long-term fluctuations, model.

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102 - ASSESSMENT OF THE IMPACT OF THE CONTEMPORARY CLIMATIC CONDITIONS ON THE CROP EVAPOTRANSPIRATION IN BULGARIA

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Crop evapotranspiration strongly depends on the physical processes in the

atmosphere. The transfer of water from liquid to vapor depends on the latent heat provided by the solar radiation and the ambient temperature. The vapor pressure difference between the evaporating surface and the atmosphere in touch contributes for the removal of vapor from the evaporating surface, and the wind - for the replacement of the saturated air above the evaporating surface with drier air. The geographical situation and the dynamics of the meteorological factors determine the quantitative characteristics of these processes. Each cropped field limits the evapotranspiration by the morphological and the physiological peculiarities of the crop and the hydrological properties of the soil under it.

The goal of this paper is to study the impact of the contemporary climate conditions in Bulgaria on the reference evapotranspiration. The relationship between the meteorological elements like solar radiation, air temperature, air humidity, wind speed and precipitation and the reference evapotranspiration has been studied. An assessment of the evaporating conditions through indices like open water evaporation, evaporation demand of the atmosphere, and a hydrothermal factor is made in parallel. The results are presented in graphics and zoning maps.

This investigation will contribute for amplification of the farming strategies and agricultural production management with proper irrigation scheduling and suitable agricultural practices in adaptation to the climate changes of the region.

Keywords: reference evapotranspiration, climate change, dependencies, zoning maps, Bulgaria

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103 - AN INVESTIGATION OF WATER TABLE DYNAMICS DURING THE YEARS OF CONTEMPORARY CLIMATE CHANGE IN SOFIA REGION, BULGARIA

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Shallow sub-soil waters are one of the sources for soil moisture in agriculture. Their presence in soil water balance saves certain amounts of irrigational water, since they satisfy part of the evapotranspirational needs of the crops. Contemporary

climate changes have a proven negative impact on the hydrothermal conditions for agricultural production. The restriction of the atmospheric water income causes a decrease in the water resources in soil, namely in the available water content and its feeding up by the sub-soil waters.

The goal of the paper is to investigate the dynamics of the water table level in the eastern part of Sofia Field during a 40-year period of the contemporary climate 1960-2000, in which warming and drought processes have been registered. The long-term levels of the water table at 4 representative manholes from the measuring net of NIMH on important for agricultural crops vegetation dates and their trends are presented.

Also, the long-term succession of monthly water table levels have been traced through the years in comparison with the monthly precipitation sums and the sums of the measured open water evaporation to find out the natural laws of determining the phenomenon. The dependence of the water levels on the precipitation sums of different periods has been studied.

The results show a decrease tendency of the water levels in the manholes, which indicates a drop of the water table deeper in soil profile and less soil water resources for the crops in the region.

Keywords: water table, climate change, agriculture, regression, Bulgaria

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107 - INVESTIGATION ON SOIL HEAT FLUX IN VERTIC LUVISOL

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The thermal characteristics of the soil are important in many fields, especially when soil is considered as a growth medium. The flux of heat into and out of the soil is a significant part of the surface energy budget and should not be dismissed in some estimates. The actual measurement of surface flux is difficult and this calls for search of other methods for easy drawing of this parameter.

The aim of present study was to examine the monthly, seasonal and annual course of soil heat flux (G) in Vertic Luvisol depending on some factors and to develop models for calculation of this parameter from easy measurable meteorological elements. The data available were five year meteorological observations, including net radiation, soil surface temperature, soil moisture, cloudiness and soil heat flux from one of the agro meteorological stations of ISS "N.Pushkarov",

situated in the area of village G.Lozen - Southwest part of Bulgaria. Observation were taken weekly and in winter months (December, January and February) - monthly. The data show a well defined seasonal fluctuation of soil heat flux. Average downward flux is shown to have a maximum at June, and the highest negative value of upward flux occurs in January. According to the analysis of variance, soil moisture followed by cloudiness have proved effect on the values of soil heat flux. Equations for monthly prognostication of G using net radiation, soil moisture and amplitude of soil surface temperature as predictors were drawn.

Keywords: Soil heat flux, net radiation, soil moisture, cloudiness, soil surface temperature

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108 - INFLUENCE OF SEASONAL FLUCTUATION OF CLIMATE AND PLANT COVER ON SOIL MOISTURE

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The investigations spanned eight years period and were carried out in the region of Sofia - village G.Lozen on Vertic Luvisol. Soil moisture under wheat, maize, rye-grass and follow land in the layer 0-100 cm at an interval of 10 cm was determined, using gravimetric method. Soil samples were taken at intervals of 10 days. Data obtained were analyzed by Statgraphics Centurion XV.

The monthly and annual distribution of soil moisture under different plant cover was defined. The depth up to which an effect of the investigated factors spread was determined. The seasonal climate fluctuations show a dominant influence on soil moisture as compared with the plant cover in the layer 0 - 80 cm. From 80 to 100 cm the effect of plant cover was prevalent. The influence of different plant cover on soil moisture in each soil layer was also defined.

Keywords: soil moisture, plant cover, seasonal variation

109 - EXTREMELY WARM WINTERS AND COOL SUMMERS IN BULGARIA

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The warm winters and cool summers in Bulgaria are investigated in the present paper through the minimal values of maximum air temperature in the summer tmin(maxs) and maximal values of minimum air temperature in the winter tmax(minw). Data for approximately 50-years period (1960 - 2007), from stations representative for the basic climatic differences on the territory of the country, are used.

Analysis of the corresponding tmin(maxs) and tmax(minw) distributions by frequency, duration and intensity is carried out. The tendencies in the fields of deviations from the (1961 - 1990) normals are also assessed. A return period approach is used for estimation of tmin(maxs) and tmax(minw) values expected at least ones in N years for climatological prognosis and the respective quantitative estimation of the air temperatures, characterizing the extremely warm winters and cool summers on the territory of the country, that could be expected.

The fields of tmin(maxs) and tmax(minw) are analysed in looking for periods lasting more than (at least) 3 consecutive days with values different (to a different extent) from the corresponding (1961 - 1990) normals. The revealed cases of prolonged and intensive periods with extreme tmax(minw) and tmin(maxs) values are also used as a basis for assessment of the corresponding typical synoptic situations.

Keywords: climate extremes, warm winters, cool summers, climatological analysis and prognosis, return period approach, anomalous winter (summer) air temperature spells, typical synoptic situations

110 - ON THE COMBINATIONS AIR TEMPERATURE - RELATIVE HUMIDITY – WIND VELOCITY AND THE ICING EVENTS ON THE TERRITORY OF BULGARIA

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Many and different parameters determine the process of icing leading usually to heavy damages and financial losses. According to the definitions mentioned in COST 727 "Atmospheric Icing on Structures. Measurements and Data Collection", State of the Art, December 2006, the meteorological icing (not the instrumental one) can be characterized by the meteorological conditions amongst which the appropriate values of wind, air temperature, humidity, precipitation, visibility (as well as the radiation, current weather, etc.) are of a great importance.

In the same time, the icing event is presently most simply defined as a period of time when the air temperature t is below 0oC and the relative humidity f is above 95% (WMO Guide for meteorological measurements). The list summarizing the main parameters required for icing models to characterize the start/end of all types of icing events begins with wind v, air temperature t and relative humidity f (COST 727, State of the Art, December 2006). The existing icing algorithms are based on grided forecast of temperature t and humidity f (from the European Centre for Medium Range Weather Forecasting - ECMWF), etc.

In view of these circumstances the present work deals with climatological assessment of the combinations (t - f), (t - f - v) favorable for icing, on the basis of data from chosen representative stations in Bulgaria, with altitude up to 1000 m above sea level, referring to the period (1961 - 2006). The spells with values of t, f and v in combinations favorable for icing, lasting more than (at least) 3 consecutive days, are looked for and the obtained series are investigated by frequency, intensity and duration. The tendencies in the occurrence of such combinations are also analysed. The revealed prolonged and intensive spells favourable for icing by t, f and v are compared with these ones of real icing events on the territory of the country.

Keywords: icing, favorable meteorological conditions, air temperature-relative humidity-wind speed combinations, climatological assessment, comparison by frequency, intensity, duration, tendencies

111 - OBSERVED CHANGES IN ANNUAL PRECIPITATION IN BULGARIA IN THE CONTEXT OF CLIMATE CHANGE

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Annual precipitation is typical characteristic of regional climate which has impact on human life and different sectors of economic. The aim of present paper is to give actual information about precipitation variability at regional scale on the background of global climate change. The accent is on investigation the role of natural mechanisms for precipitation variability and study precipitation in relation of extreme events - drought and floods.

Monthly precipitations from Bulgarian meteorological stations and data for sea level pressure, North Atlantic Oscillation (NAO) indices and East Atlantic (EA) pattern are used for the research. Main investigated period is 1931-2005.

To detect regional changes in precipitation variability and duration of dry and wet periods, the Rainfall Anomaly Index (RAI) and Cumulative Precipitation Anomalies have been calculated. The degree of irregularity of the annual variation of precipitation is determined on the base of the vector expression of annual variation of precipitation. The seasonality index is calculated and the occurrence of month of the concentration of precipitation is studied.

The results of this paper present the spatial distribution of precipitation fluctuation and determine to what extend rainfall variability is related with the variation in large-scale circulation.

Keywords: degree of irregularity of annual precipitation, sea level pressure, NAO.

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114 - IMPACT OF CLIMATE CHANGES IN PRECIPITATION REGIME IN BOSNIA-HERZEGOVINA

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Side effects of climate changes have been showed as follows:

- increase of average temperature about 0.7°C in the past 100 years
- annual sum of rainfalls with no severe changes (only ± 5% in the past 100 years depending on the region in B&H).

However we became aware of the existence of very warm and very cold short periods, as also their consecutive fast exchanges, which have the opposite effect on humans health.

Mentioned above had impact also on changes in precipitation regime. We observed four stations in B&H (Sarajevo, Mostar, Tuzla and Bjela-nica). Since the station in Sarajevo have unremitting term since 1901 till now, it was interesting to examine difference and progress of the climate changes, so we used term 1901-2006 and 1951-2006, for the other stations only term 1951-2006. Studied maximal daily precipitation: one daily , two daily, tree daily and five daily maximal precipitation. Beside that we consultated maximal decade and pentad values and rain of short terms for the same terms above. It was interesting to join linear trends to these terms and thus ascertain increase of these values brought up above, but in the same time we had increase of drought period. Only for the station Bjela-nica we have different situation, which means decreasing of these values.

All this is especially noticed in the year 2007, when we in the period April-September had more extreme warm and extreme cold periods, which were followed with drought and extreme precipitation.

Keywords: linear trend, climate, temperature, precipitation, drought, precipitation regime

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123 - SLIDING AS HILLSIDE PHENOMENOM IN THE NORTH EASTERN PART OF KOSOVA

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In the complex of the side phenomena of the north eastern part of Kosova, sliding who appear in a quite different dimensions play an important role in the landscape modeling; in some territories are ran in into a strong collapse, especially during tectonic abruptness. Quite developed sliding show during the tectonic contacts of magma rocks with those terrogene, thus during the destruction streak including

scrapped koluvo- proluvial materials and those deluvial of the scab conveyance.

The widest expansions of these phenomena are along the limitative banks of Llapi and Kosova hollows including the hilly-mountainous and mountainous in the periphery. The laky Pliocene argil supersaturating with water during their contact with dibasic rocks but also those terrogene flysch and regressive. erosion of the Llap river branches have created conditions for displacement of scrappy material quantities set up on these argil.

Keywords: Sliding, Displacement Hillsides, Pliocene lake argil, Regressive erosion

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127 - TRENDS IN TURKEY CLIMATE EXTREME INDICES FROM 1971 TO 2004

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Given the complexity and global nature of the climate system, cooperative activities within international and interdisciplinary programs are indispensable for monitoring and predicting climate change.

Extreme climate events usually have strong impacts on society and a small change in the mean condition can cause a large change in the likelihood of an extreme. A joint WMO CCl/CLIVAR Expert Team (ET) on Climate Change Detection, Monitoring and Indices has defined 27 core climate indices mainly focusing on extreme events using freely available software, RClimDex, developed and maintained on behalf of the ET by the Climate Research Branch of Environment Canada.. Indices have the advantage that they can be freely exchanged within the international scientific community. The complete list of the 27 indices, RClimDex software and users guide are available from http://cccma.seos.uvic.ca/ETCCDMI.

RClimDex creates 27 core indices after performing several QC checks on the raw data. The information provided by the indices not only includes how the mean values changed over time but how the statistical distribution of the data changed. Also results give us very important information about the trends in extremes. We have run RClimDex for 100 stations in Turkey for the period from 1971 to 2004. We selected the same data period in order to compare station's outputs for the same climatic period. To provide an overall picture of climate variation in the country, we computed average trends for every index, relative to the period 1971-2000.

The results show that numbers of summer days and tropical nights have been increasing all over Turkey while ice days and frost days decreasing. Summer days have increased about 6 days per decade. Most of the trends are statistically significant at the 5% level. Growing season length has increased over Turkey except for coastal regions. This will be have a positive effect on summer agricultural products but some negative affects will be experienced by orchards for example which rely on cold conditions. Maximum of maximum, minimum of maximum, maximum of minimum and minimum of minimum temperatures have increased at most stations. Warm days and warm nights have been increasing all over Turkey while cool days and cool nights have been decreasing. Warm spells have increased while cold spells have decreased. Diurnal temperature range has increased in most inland stations while it has decreased along coastal areas.

Trends in simple daily intensity index have been increasing in most of the stations even mean annual total precipitation declined in 30 stations located in the Aegean and inland Anatolia. The number of heavy precipitations days have been increasing especially in the Black Sea and Mediterranean regions and usually cause extreme flood events. The maximum one-day and 5 days precipitation have also increased except eastern Marmara and south Anatolia region. Consecutive dry days have decreased especially in Konya, Karapýnar, Ceylanpýnar and Igdir which are suffering drought problem but unfortunately there are increasing trends in Marmara, Aegean and the Black Sea Region. Consecutive wet days have increased especially in eastern parts of the Marmara and around Afyon, Burdur, Ni-de, Sinop, Sivas, Rize, Kilis and Mu- while decreasing in the Aegean and Koňya.

In summary, in general there are large coherent patterns of warming across in the country affecting both maximum and minimum temperatures but there is a much more mixed pattern of change in precipitation.

Keywords: Extreme events, climate change, climate indices, climate monitoring

134 - THE DIRECTIONS OF THE THERMAL STRATIFICATION TRANSFORMATIONS OF UPPER RADUNSKIE LAKE AS A RESULT OF OBSERVED CLIMATIC CHANGES

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During the last fifty years a significant, positive trend of mean annual water

surface temperature (WST) in dimictic Upper Radu-skie Lake was observed. One of the reasons was the variations in local climatic conditions. The mean rate of WST increase over the period 1961-2005 amounted to 0.03°C yr^{-1} (r^2 = 0.361, p<0.0001). Treating the WST changes as the whole response of the lake system to the climatic conditions, it was decided to examine especially the influence that those climatic variations have on thermal stratification of the lake. With the use of midsummer temperature profiles (VII-VIII) collected in years 1971-2005 the mean values of seven stratification descriptors were established for each year: epilimnion depth (EPD), planar thermocline depth (THD), epilimnion (EPT) and hypolimnion (HYT) temperatures, maximum temperature difference (MDT), 10°C depth (D10) and water temperature at 15m (T15).

Stratification variables were compared to the following meteorological variables: spring (IV-VI) and summer (VII-VIII) mean air temperatures, spring and summer insolation, wind speed during spring and summer and the ice out date and duration of ice cover.

The correlation analysis demonstrates that the mean values of T10, EPT, MTD, T15 and HYT have shown significant trends (p<0.005) over the surveyed period, with the increase in maximum temperature difference (r=0.640) and epilimnion temperature (r=0.610), reduction in the 10°C depth (r=-0.599) and decrease in water temperature at 15 m (r=-0.494). Less spectacular, but also significant (p<0.05) were the trends of the mixing depth (r= -0.415) and the thermocline (r= -0.342) shallowing.

The results of the canonical correlations, on the other hand, show that the considered meteorological variables well explain the variability of summer lake thermal structure (total redundancy - 63.4%). The first canonical correlation (R = 0.918, p< 0.0001) indicates that the changes in D10, T15, HYT, EPD are highly related to temperature, insolation and wind speed in spring. The second canonical correlation (R=0.891, p<0.0001) explain the changes in EPT and MTD, conditioned to lake ice phenology, temperature and wind speed in summer.

In spite of very small lake area (0.39 km^2) the variations in the thermocline depth and mixing depth caused by climate warming represent tendencies typical for large lakes (shallower thermoclines). This state should be related to the fact that mean wind speeds tend to reduce and also to the transformation of the regional wind field within the subglacial channel witch it occupies.

135 - INVESTIGATION OF ANNUAL PRECIPITATION TRENDS IN HOMOGENEOUS PRECIPITATION SUB-DIVISIONS OF WESTERN IRAN

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Regional annual Standardized Anomaly Index (SAI) was computed for 5 homogeneous precipitation sub-divisions of western Iran in order to assess precipitation variability during the last 35 years. For this purpose, 170 stations regularly distributed across western Iran and cover 1965-2000 period were used. The normality and reliability of the computed SAIs were checked respectively using Kolmogorov-Smirnov and F ratio tests. Monotonic trend in annual SAIs were evaluated using Mann-Kendall and Spearman ρ tests. The results indicated that the regional annual precipitation experienced a decreasing trend in 3 sub-divisions located in the northern part of the study area, while in the south of the study area the regional annul precipitation increased insignificantly. Therefore, we observed a dipole precipitation variability and trend in western Iran.

Keywords: Trend, Precipitation, Standardized Anomaly Index, western Iran

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136 - FOG WATER AND DEW WATER MEASUREMENTS IN CROATIA

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This paper presents the daily fog water amounts collected with a standard fog collector (SFC) during the period between 2000 - 2007, during the warm part of the year. SFC was installed on Zavizan, geographically the highest meteorological station in Croatia (1594 m above sea level). The highest daily collection rate was 27.8 l/m-. The dew condensers are installed on the islands Vis, Bisevo and Zadar. On Bisevo the roof 15.1 m^2 is equipped with Polycarbonate for collecting dew water.

137 - CLIMATOLOGICAL DATA ANALYSIS FOR NUMERICAL AND EXPERIMENTAL DETERMINATION OF CBL HEIGHT VALUES

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The dynamics of the mixing layer height is an ABL characteristic important for the distribution of pollutants and aerosols in meso and micro scale tasks.

Climatological convective ABL height values for Sofia are obtained by determination of the mixing height (MH) under convective conditions applying two approaches - numerical and experimental. The numerical method utilizes the CBL model YORCON with input parameters determined from radio-sounding data. The experimental method determines directly the MH from the profiles of the potential temperature derived from the radio soundings.

The investigated period covered data from regular radio-soundings performed with Waisala radio-soundings system at 12GMT from Sofia Aerological Observatory for a period between 2001-2006.

The Convective Boundary Layer (CBL) model YORCON can be used for determining the height of the mixing layer applying regular and readily accessible information for the external ABL parameters taken from aero-climatological data or directly from radio-soundings studying individual and average for a given time interval realization of convective conditions. The model is developed in accordance with the Monin-Obukhov similarity theory. Applying the similarity theory and resistance lows, the internal parameters as Monin-Obukhov length scale, friction velocity, and cross isobaric angle are determined from the external parameters as geostrophic wind and the difference between the potential temperature at CBL height and at the ground. The external parameters can be determined from the numerical weather prediction or from radio sounding data. In the present study different radio-sounding data are used. Applying the CBL model YORCON and input data taken from the radio-soundings some turbulent characteristics such as friction velocity and turbulent fluxes were estimated in addition to the CBL height.

The results from the comparison between MH data and other parameters as surface heat flux, friction velocity determined during chosen experimental period characterized with convective conditions are analyzed and discussed from climatological point of view.

Keywords: Urban climate, atmospheric boundary layer (ABL), convective boundary layer (CBL), turbulent characteristics, radio-sounding data

138 - THE EFFECTS OF THE CLIMATIC CHANGES UPON THE QUALITY OF ENVIRONMENT AND LIFE

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The issue of the climatic changes is no longer a subject about which we should refer to in the future, but a current subject. The climate represents one of the environment factors with major impact upon human being, and this is the reason for which the study of the effects brought about by the climatic changes is one of the most current themes on international level.

The purpose of this study is to assess the quality of the environment and the people's life as well as the elaboration of certain proposals regarding the improvement of the already existing problems. We focus upon the health and social level of the population affected by the climatic changes.

Keywords: quality of the environment, quality of the population life, the impact of the climatic changes.

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144 - RECENT GLACIER CHANGE IN MOUNT SUPHAN USING REMOTE SENSING AND METEOROLOGICAL DATA

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Glaciers, particularly mountain glaciers are sensible to global climate change because of their surface temperature which is near to melting/freezing point. Thus, studies about monitoring glaciers are increasing in recent years. It can be seen in glacier studies, remote sensing has been using by many researchers in parallel with the development in satellite technology. As a part of monitoring the

recent glacier change of Turkey's mountains project, Mount Suphan has been studied using Landsat images. MSS false colour composite images and TM4/ TM5 band combination has been used for delineating glaciers, and applied the change detection techniques to determine the change on glacial area. Also, this results have been compared with meteorological data. As a result, it can be said that there is a recession in Mount Suphan glaciers due to global climate change.

Keywords: Glacier, Global Climate Change, Remote Sensing, Turkey

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145 - GLOBAL WARMING AND ENVIRONMENTAL SECURITY

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In traditional sense, the notion of "security" is defined as political and military threats directed against the national sovereignty. The boundary of this notion is widened after 1990s as environmental issues and their global and trans-boundary aspects became a threat to the security of nations. In Millennium Project, the environmental security as defined as "the relative public safety from environmental dangers caused by natural or human process due to ignorance, accident, mismanagement, or design; originating within or across national borders".

Global warming, probably the primary environmental problem today, is one of the most serious environmental security threats of the next 10 years. Global warming has an effect on world's average temperature and consequently on annual rainfall rates. The rise on world's temperature quickens the melting process of the glaciers. As a result the seawater levels would rise and endanger the territorial existence of the island and archipelago countries, as well as countries at or below sea levels. In addition to that, the negative effects of global warming on water resources are undeniable today. These effects would lead to scarcity of water resources, which is vital for the continuity of the human survival. Water resources are not distributed equally across the world.

Today in the regions where water resources are scarce, conflicts on the allocation of water resources are widespread, especially in the Middle East. Such conflicts would tend to spread even further in the near future.

Keywords: Environmental Security, National Sovereignty, Global Warming, Water Scarcity

149 - CLIMATOLOGICAL ANALYSIS OF THE SYNOPTIC SITUATIONS CAUSING EXTREME PRECIPITATION EVENTS OVER BULGARIA

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Heavy precipitation events often lead to river floods and flash floods causing significant losses of life and property damages, landslide activation, and other social and economic problems. The upward tendency of damages, caused by natural disasters, supports the idea that extreme events, associated with the effects of climate change, occur with greater frequency recently. The series of hazardous precipitation events which affected Balkans and in particular Bulgaria in 2005 show that additional investigations of such type of phenomena are necessary in order to be able to predict them more precisely.

Meteorological data from the database of the Bulgarian National Institute of Meteorology and Hydrology (NIMH) from 65 climatological and 26 precipitation stations below 1000 m of altitude, for the period 1961-2006, was processed. The regime of potential dangerous heavy rain/snow events (totals over 30 mm/day are considered as risky for floods), which occurred in more than 4 districts in Bulgaria, is compared with total precipitation amounts for two periods: 1961 - 1990 and 1991 - 2006. Significant increasing (more than 40 %) of days with heavy 24-hour precipitation is received, while the total annual rainfall shows slightly decreasing trends in many regions of the country.

The NIMH historical archive of synoptic maps and NCEP/NCAR Reanalysis data files are used for analysis and classification of the synoptic situations causing heavy rain and damages in at least 4 districts of the country. The fields of air pressure and wind velocity are also considered.

Classification of the typical synoptic situations leading to such type of extreme events is carried out.

Keywords: extreme precipitation, flood events, synoptic situation

171 - AGROMETEOROLOGICAL CONDITIONS IN BOSNIA AND HERZEGOVINA DURING THE LAST TEN YEARS WITH SPECIAL OVERVIEW ON 2007

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In the the last ten years on the territory of Bosnia and Herzegovina was observed significant weather variability followed by the short heat and cold waves. It impacts on the regime of temperatures and precipitations, as well as others agrometeorological conditions.

Special impact was expressed on the beginning of period with average daily temperatures higher or equal to 5 0C which is directly connected with duration of vegetation period. Compared to annual series from 1961 to 1990, we noticed that temperatures of soil have increased.

Parallel to changes in regime of precipitations, we also noticed changes in number and duration of drought period. Values of Palfai Aridity Index shows trend of drought increase.

Water soil balance shows significant variability according to the changes in regime of precipitations. It should be reiterated that drought periods, extreme precipitations and less number of days with snow cover are more frequent. All this mentioned above has an evident influence on the vegetation, where the same can not be characterised as negative.

During 2007, drought period from April to August has been noticed, accompanied by the wave of high temperatures during the summer. Effects of more precipitations in May and June are reduced with strong short-term intensity.

Keywords: drought, vegetation period, heat waves, cold waves precipitations.

176 - AGROCLIMATIC RESOURCES IN BULGARIA FOR FIELD CROPS CULTIVATION UNDER IRRIGATED AND RAIN-FED CONDITIONS

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The impact of climate change upon the agroecosystems is thoroughly investigated during the last decades in order to establish the effect of some detrimental meteorological factors on the agricultural production. Only the performance of several meteorological elements is observed, but not the interaction between them and their combined impact upon agriculture. The final financial losses are reported, but not the interaction between the natural resources and the economic activities.

Advanced technologies that would guarantee highly efficient agricultural production need an integrated research method that would establish not only the result from the negative meteorological impacts, but the causes, too. The dynamic interaction between the meteorological factors and the parameters of the agroecosystems, especially the biological components, and their functionality, should be investigated. Tendencies, future statuses, and development prognosis for the agroecosystems should be established. The rural areas effective strategies need precise zoning of the agroclimatic resources as well as indices for characterizing the conditions of the agricultural production.

A new information groundwork would help: the centralized governmental bodies for a regional framework for agriculture; the governmental and non governmental structures and funds for a subsidiary policy in agriculture; the insurance companies for risk assessment and the sown fields insurance; the farmers for adequate reaction to the current and expected changes in the crop growing conditions.

The outcome will be an improvement of the agricultural production management, a better balance of expenses, soil and biological environment protection, and high quality and safety of foods.

Keywords: agroclimatic resources, optimal conditions, zoning of agriculture

179 - THE ROLE OF HISTORICAL DATA SERIES OF SEDIMENTATION MEASUREMENTS ON THE RIVERS DRAVA AND MURA IN CROATIA

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The importance of sustaining sediment measurements and monitoring could not be overemphasized, whether the engineering construction is under construction or only in plan, because the disastrous consequences are many times more expensive then the costs of regular measuring. Also, the historical data series are very useful for models calibration and verification to predict same future events in flow regime and in the basin area.

Beside, the important rule of measuring data is priceless in analyses of long-term changes in river basin during the longer time period. In this paper we give a review of the results of the sedimentation load and bed load measurements on transboundary rivers Drava and Mura in Croatia during long period with accent on year 2006. Considering geomorphology and instability of river bed and high requirements from community on the other hand, information of sediment dynamics give us ground for making better decisions in the future.

Keywords: load regime, disastrous consequences, bed geomorphology, historical data series, prediction models verification, long-term changes.

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181 - DETERMINING THE CRITICAL TEMPORAL PATTERN OF SUSPENDED LOAD IN RIVERS AT DIFFERENT CLIMATES IN IRAN

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The sediment delivered to downstream is a result of some processes that start with several forms of erosion in the uplands, and transport to the rivers. River's suspended load make's various problem in downstream, such as change the

ecosystem, disturbing the water structures and fill the reservoir's dam, etc. Wide information is needed to manage the processes. Temporal pattern of suspended load is one of the parameters that can help managers of natural resources to have more effective plane.

This study has been down in some rivers of three climates (dry medium& humid) of Iran that have suitable sediment data. Sediment rating curve has drew for both areas and the equations has calculated. Data's in sediment rating curve, devided into two parts, regarding to their placement at the under or upper part of the line. Another sediment rating curve has been drawn for each group of data's and each resulted group divided into two groups, again.

For next stage monthly data's frequency extracted for each curve. The results showed that data frequency of upper part of the curve that show the months with high sediment rate and data frequency of under part of the curve that show the months with low sediment rate. Finally we had a comparison between months of high and low sediment load in different climates.

Keywords: Suspended sediment, Temporal pattern, Flood-sediment relationship, Estimation of suspended sediment load.

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189 - SPATIAL DISTRIBUTION OF SETTLED AND AIR POLLUTION IN MITROVICA: COMPARISON BETWEEN SEASONS 2006-2007

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This part of northern Kosova-Mitrovica constitutes one of most important mining field in Europe. Consequently the industrial activities were mostly connected to the exploitation of the base metal ores of the Trepça district as well as the smelter of Zveçan and the Trepça battery factory. The town of Zveçan and Mitrovica have been exposed for many years to the poisons emissions of the Zveçan stacks. Indeed, according to a crude estimate, about a ton of lead vapours were daily related to the atmosphere through the main stack Because of the imposing emissions, the KFOR Headquarters decided to stop in August 2000 the roasting plant activity at Zveçan

Mineral and anthropogenic dust components considering health problems, related.'

The focus has been on dust inhalation, due to dust suspended in the air. However, exposure to certain types of settled dust and it's associated contaminant load can be detrimental to human health. In certain environments, airborne particles and dust are especially undesirable, as they constitute contaminants that interfere with the activities conducted in these environments.

A total of 20 roadside side in were selected which covered the most urbanized and densely populated area. It was found that pedestrians exposed to 24 hour average and airborne dust ranged from 78.361 to2806.10 mg/m²day and 0.0954 to 0.856 microgram/cubic meter, lead.

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190 - ASSESSMENT OF THE WATER PARAMETERS OF VERTISOL UNDER DIFFERENTAGRICULTURAL PRACTICES

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The complex influence of different agricultural practices into some water parameters change was studied in long-term field experiments carried out on Vertisol in Sofia district. Five different soil tillage systems and three levels of fertilizer application in crop rotations with of compacted and without compacted were tested. The soil tillage systems elaborated on the basis of reducing their numbers, depth and way of the soil tillage.

The data resulting from these experiments showed that the crop rotation with different extent compacted as winter pre-crops decrease the moisture content in the soil layer.

The conventional tillage system increase total water supply and quantity of water productivity in soil. The water permeability of Leached Vertisol is considerably improved after application of conventional and rational soil tillage systems.The most appropriate soil tillage systems in the crop rotation is the rationality soil tillage system which ensure big quantity soil humidity and high productivity of crop cultivation.

Keywords: crop rotation, soil tillage, fertilization, soil moisture, total water supply, water permeability

191 - METHODS FOR PLANT WATER STRESS EVALUATION OF SOYBEAN CANOPY

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It is known that the prolin content in the plant leaves increase several times under soil moisture and humidity deficit. This allows us to use it for water stress indicator.

Some stress factors as temperature, water deficit etc. lead to increasing of the passive ions current because membrane wholeness is decreasing. This can express on the base of the electrolyte content, measured by conductometer. When the plants grow without water deficit, they transpire and leaf surface become more cool. Under water deficit conditions their temperature increases. On this base the difference between canopy temperature(Tc), measured by Infrared thermometer and ambient air temperature(Ta) can be used as a stress indicator too.

Prolin content by Bate's method, total electrolyte content by electro-conductivity in the plant tissues and canopy temperature by IRT were evaluating during four year (2004 - 2007) field experiment with 8 soybean genotypes and 2 sorts as standards on meadow- cinnamonic soil in Tzalapitza (Sought Bulgaria).

The tolerant to drought(DR dray resistance) genotypes increased proline content three-four times under dry conditions. Responsive to irrigation (IR - irrigation responsible) genotypes increased proline content 2- 3 times under non irrigated conditions, and that allows us to suppose almost equally effect of water and temperature stress.

The results from electrolyte content determination at the field experiment showed in comparison of optimal irrigated variant the two times increasing then under non irrigated variant and the variant with the higher total irrigation depth in 2006 (the low oxygen in the soil is the other stress factor).

Measurements with infra red thermometer (IR) were carried out every day at 2 h p.m. On base of these measurements were realized irrigations in the irrigated variants. A relationship "temperature difference- irrigation depth" with $R2 > 0,8$ was obtained. It is important to remark that canopy temperature of DR- genotypes was higher in comparison with IR-genotypes, even after irrigation. The higher temperature with 0,5 - 2,5 °C was measured during whole vegetation season. This could be a result of lower evaporation rates for DR-genotypes, these plants hold the water in the tissues for a long time and that is why they are tolerant to drought.

Having considered our results indicated higher values of proline and electrolyte content for DR plant genotypes compared to the IR plant genotypes under equal conditions and concomitant determination of prolin and electrolyte leakage were a good test-system for the resistance or tolerance to drought.

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192 - INFLUENCE OF IRRIGATION REGIME ON THE SOYBEAN PRODUCTIVITY

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The influence of the abiotic stress is one of the factors that mostly reduces agricultural produce. Low air relative humidity (lower than 30%) in combination with high air temperature (above 350°C) causes high evaporation rates, which in turn leads to disturbance in the crop water balance and low crop yield.

Striking off the list the economic factors the drought, permanent or temporary is one of the major limiting factors in the soybean production not only in our country but in global scale. That is why efforts of a great number of scientists are aimed to studies on the physiological adaptation of the plants to water stress and on developing effective methods for evaluation of plant tolerance in selection programs. Different methods of fighting against the drought are put into practice in agriculture. One of the effective measures concern developing the drought resistant varieties of crops (genotypes) and conservation and rational use of soil water reserve. In order to prevent the plants from the high temperatures a development of hot resistant varieties are presumed.

Four years experiment (2004 - 2007) was carried out with eight soybean genotypes and two sorts "Daniela" and "Hodson" as standards on the meadow - cinnamonic soil in Tzalapitza(South Bulgaria). The climatic years were very different: from dry (2007) to very wet - 2005.

During the first two years were realized only nonirrigate and optimal irrigated variants. In 2006 were realized variants with missed irrigations in the different growth stages and with higher than optimal total irrigation depth and in 2007 - with different irrigation depths (0 ÷ 1,3).

Gypsum blocks and tenziometers were used to evaluate soil water regime and infrared thermometer was used for plant water status evaluation by the difference Tc (canopy temperature) - Ta (environmental air temperature).

The resistant to drought and responsive to irrigation genotypes were choosen. The relationships "Y (yield) - irrigation depth", "Y - temperature difference" with R2 >0,8 were obtained.

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201 - WARM WINTER RISK IN ROMANIA

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Climate variability offers big surprises in the succession of seasons in this country. The past few decades have witnessed situations alien to the characteristics of Romania's temperate climate. For example, the winter of 2006-2007, which according to the history of Romanian meteorological records appeared to be the warmest compared to other warm winters, such as the 1935-1936 and 1947-1948 ones. Local deviations topped 9-C (the highest values being registered in the Cujmir-Calafat sector, south-west Oltenia). The very low quantities of precipitation, far below normal values, prefigured the drought of the coming year. What caused that situation were the North Atlantic Oscillations (NAO) that persisted for a long time, favoring the penetration of tropical (Saharian) heat waves, and hampering the fall of precipitation, a phenomenon assigned to global warming. If until 1960, warm winters might have occurred once in 10-15 years, after 2000 they would occur every 2-3 years.

Were NAO to persist also in the future, there is the risk for warm winters to become increasingly more frequent in Romania.

Keywords: risk phenomena, warm winter, Romania.

203 - COMPARISON OF SUSPENDED LOAD TRANSPORT REGIME AT CHARACTERISTIC HYDROLOGICAL STATIONS IN CROATIA

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Characteristics of suspended load transport occurrence and dynamics belong among the most variable and least studied hydrological phenomena. This paper describes a comparison of the suspended load transport occurrence and dynamics in several characteristic cross-sections in Croatia with long-term data series. The cross-section in Slavonski Brod on the Sava River and the cross-section in Botovo on the Drava River are representative of the suspended load transport in major rivers, and the cross-sections in Hrvatsko on the Kupa River, Kupljenovo on the Krapina River and Dubravica on the Pazin-ica River are typical for suspended load transport in minor streams.

The analyses carried out on the sections include characteristic daily suspended load concentrations and total daily, monthly and annual suspended load transport. Annual changes were analyzed of the said characteristic parameters of suspended load, along with their trends, suspended load frequency curves, suspended load transport duration curves, and their within a year distribution. The obtained results and determined changes have been analyzed considering possible antropogenic impacts on the load transport occurrence and dynamics.

Keywords: suspended load, suspended load concentration, suspended load transport, Croatia

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206 - CHANGE OF RELATION BETWEEN NORTH ATLANTIC OSCILLATION AND PRECIPITATION OF SOUTHWEST ANATOLIA

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North Atlantic Oscillation (NAO) is one of the major factor that affects weather conditions in the Northern hemisphere. The effects of positive and negative

phases of NAO appear as less precipitation and much precipitation respectively in Southwest Anatolia. In this study, the relation between NAO and Southwest Anatolia precipitation and its change in time is evaluated by using statistical methods. Since 70 % of the yearly total precipitation occurs between December - March, study focused on this period. NAO and the precipitation of Southwest Anatolia have been characterized by standardized Hurrell winter index and the yearly total precipitation observed in the study area respectively.

The study indicates that relation gets stronger in the last decades. This period at the same time corresponds to the increase in the global CO_2 concentrations. The results show the effectiveness of the global warming on NAO and precipitation of Southwest Anatolia.

Keywords: NAO, Precipitation, Hurrel index

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208 - ACTUAL AND POTENTIAL EROSION RISK ANALYZES-CASE STUDY VODNO MOUNTAIN - SKOPJE

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As a consequence of the low civilization level in the past and irregular activities, a lot of the land was transformed to bareland. Usually, the natural processes take over with the self-restoration but in extreme conditions it is practically impossible. The human with adequate activities change this situation and help the nature to set up the normal regime. The Aforementioned facts are representative for the Vodno Mountain (4500 ha). The area situated on the foot of the Vodno hill-side in the past has been affected by torrential floods continuously (the last one happened in 1951 when a lot of damages occurred, a lot of injured and 1 killed). Because of this, it was recognized as a mayor problem in that period; so that is why it was subjected to biological, technical and hydraulic erosion control activities to remedy the situation. Activities were carried out on the northern slopes towards the central part of Skopje. The other slopes (eastern and southern) have not been treated yet although the city of Skopje extends in this direction.

Nowadays this problem is still real because of big potential risk of loosing the forest cover (especially as a result of actual wildfires in the latest period) and going back near to the initial situation from 50 years ago.

The main task in this study is to identify the current risks from erosion on the Vodno Mountain and also an effort has been made to create a hypothetic scenario if the vegetation cover was removed and to assess what kind of impact would occur on the current situation. A model has been established using the tested Erosion Potential Model (by Gavrilovic) implemented in GIS/RS environment. The model was created on the basis that it can be operationally used in everyday life and also it can be transferred on other study areas. Because of this, standardized input data was used: DEM, soil map, geology map, topographic maps and some available "medium to high resolution" satellite imagery.

Keywords: Erosion risk, Vodno , GIS/RS

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211 - SOIL WATER REGIME IN RELATION TO SOME PHYSIOLOGICAL INDICATORS OF THE GRASS SPECIES

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The global climate changes are related to worsen climatic conditions in our country. A lot of seriously problems with irrigation water lead to necessity of using of dry resistant vegetation in the green areas.

Three-year pot experiment with Festuca rubra L., Festuca pseodoovina HACK and Agrostis alba Sibth was carried out to evaluate the effect of soil water regime on some physiological features at grass species.

Three types of soil substrata (vertisols with 0 % of building materials, vertisols with 25% of building materials and vertisols with 50% of building materials) were used under 2 soil water regimes - 50% and 80% of the field capacity (FC). Total nitrogen, total phosphorous and potassium were determined in the grass biomass. Prolin content was analyzed in the second and third years after the IVth cut. The chlorophyll content was determined in the third year - after the latest cut in the experiment (October 2007).

In Festuca rubra L. the prolin content increased times higher at 50% FC soil water regime compared to 80 % of FC. The chlorophyll decreased simultaneously with increase of building materials. This decrease was more slowly in Festuca rubra L. - compared to the other two grass species. At two water regimes the content of total N, total P and K for the grass biomass was the highest in Festuca rubra L. - independent on the amount of building materials.

The results observed show that Festuca rubra L was the most dry resistant grass species.

Keywords: water regime, irrigation, vertisols, green areas

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214 - EFFECT OF IRRIGATION AND MINERAL FERTILIZATION ON THE YIELD OF MAIZE

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It is investigated the influence of irrigation regime and mineral fertilization on the yield of biomass and grain of maize. Data are used from complex field experiments with maize of sort Kneja-509 grown on chernozem. It is established that for maize production at irrigation conditions, important condition is the interaction between the irrigation, the fertilization and the density of plants.

The maximal yield of maize biomass and grain is reached for 6 irrigations with a norm ≈ 300 m^3 and a density of plants ≈ 3000/ha and fertilization $N_{120}P_{90}$.

Keywords: grain, biomass, irrigation, tillage, yield, maize

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215 - INFLUENCE OF SOME AGROTECHNICAL ACTIONS ON THE SOIL AND YIELD UNDER IRRIGATION

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The Effect of soil tillage (ploughing, harrowing) and mineral fertilization (N_{80} P_{80} K_{80}; N_{120} P_{120} K_{60}) for non irrigation regime and two irrigation regimes (moderate, intensive) on the soil properties and yield of winter wheat is investigated.

Data of several years complex field experiments with winter wheat grown on calcerious chernozem. It is established that for the soil under investigation characterized by equilibrium volume mass in the arable layer (1,25 %/cm^3) there are conditions for minimization of soil tillage (harrowing). This implies energy saving and preservation of physical and water parameters of soil from degradation in a regime of irrigation.

In both (irrigation and non irrigation conditions) higher yield corresponds to the case of harrowing and use of N_{120} P_{120} K_{60}. The higher yield is active for the intensive irrigation (≈ 7000 kg/ha).

Keywords: irrigation,tillage,fertilization,yield,wheat

225 - A RELIABLE METHOD FOR DETERMINING THE SOIL MOISTURE TO ATTAIN BETTER IRRIGATION SCHEDULE

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There are several damages caused by over-irrigating practice: water losses, pollution of the ground water, the worst of the air conditions, soil structure and nutrients in the active root zone. More of the irrigation farmers want to know how much and when to apply and to attain better irrigation schedule.

There are different techniques and instruments for measuring the soil moisture. In this paper an easy and useful method is presented to determine the soil water deficit. The soil moisture distribution was estimate for two orchards with drip irrigation systems, formed on the different soil types - leached cinnamonic forest soils and leached chernozems vertisols. The experiments were provided during July and August, when the evapotranspiration were maximum. The configuration of the wetted contour was estimated by taking soil samples from every 20 cm in a depth, 24 hours after irrigation.

By the statistical processing of the data the regression equations and correlation coefficients were obtained. One of the most important results was the estimation of a correlation between mean values of the moisture in the 90- cm and 30-cm layers respectively for large diapason - from the wilting point up to the full capacity.

Keywords: Soil moisture, water management, water permeability.

226 - SOIL MOISTURE DISTRIBUTION INTO THE ROOT ZONE AND ITS DYNAMIC DURING IRRIGATION INTERVAL

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The problem with distribution of the soil moisture into the active zone is complicated because of the influence of many and different factors: soil structure, application rate, soil moisture before irrigation, etc. The efficiency of the irrigation depends mainly on forming of definite wetted volume in the layers near the root system of the plants during the whole vegetation period of the crops. In this paper it was presented distribution of the soil moisture in different technical and technological parameters of the drip irrigation system to evaluate the content of the plant`s need of water.

Three variants of the application rate were investigated. The soil moisture distribution in the root zone was determined by soil samples, taken at 36, 60 and 84 hours after watering. The obtained experimental results were analyzed through the size and location of the wetted volume and their dynamic during irrigation interval.

Keywords: Soil moisture, water management, water permeability.

227 - PECULIARITY OF AGROMETEOROLOGICAL INDICES CHANGE ON THE TERRITORY OF THE REPUBLIC OF MOLDOVA

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The comparative study of two agrometeorological observation periods: 1955-1975 and 1980-2000 shows that agrometeorological indices had changed considerably during the last 50 years.

Dates of winter season beginning and end have changed. Nowadays winter begins on an average for 6-8 days later, but ends for 6-11 days early in comparison with the previous observation period. In modern agrometeorological conditions active agricultural crops vegetation begins 5-8 days earlier. Vegetation stops in time. Duration of spring period and a period of plant vegetation increased for 4-12 days. However winter and summer seasons duration increased for 3-10 days in the Northern part of the country and in the south it decreased on 2-6 days.

Sum of positive air temperatures increased for 80-100 °C on investigated territory.

Agricultural crops react differently to environment condition changing. Nowadays vegetation resuming of winter wheat begins 5-10 days earlier in comparison with the previous observation period. Grain ripens 3-4 days earlier, too. Because of early spring beginning, maize sowing begins for 3-6 days earlier. In the Central and Northern parts of the country maize grain ripening begins 8-10 days later, contrary to the South of the country, where grain ripening begins 2-6 days earlier in comparison with the previous term.

Atmospheric precipitation and readily available moisture reserves in soil constitute one of the most important criteria in the moisture supply determination of plants. During last years precipitation amount during the active vegetation period of plants increased on an average for 40-50 mm. Peculiarities of soil moisture change from 1951 to 1990 were determined by the soil moisture comparative study carried out during two observation periods: 1951-1975 and 1961-1990. Soil moisture quantity from 1961 to 1990 is determined to be 5-10 mm higher on maize field and 10-20 mm higher on winter wheat field in comparison with 1951-1975 observation period.

Aridity change of the territory of the Republic of Moldova was determined by use of moisture indices. It has been determined that absolute quantities of moisture indices during the last 50 years have increased in comparison with the previous period.

There is a 0,1-0,3 increase of Seleaninov hydrothermal coefficient describing moisture conditions of the warm period of the year. Moisture indices by Shasko and Ivanov increased for 0,15-0,30. One should expect that improvement of moisture condition of plants would increase the absolute magnitude of indices. But drought became more frequent during the last 50 years (once a 2-3 years), and consequently losses caused by droughts increased. It is necessary to mention that precipitation amount in a year is taken into consideration in the estimated formulas of above-mentioned indices. But water accumulated during the cold period of the year, not always preserve till the beginning of aridity period. It may be possible that above indices do not recognize short and very strong droughts. Besides, very often plants condition after short and extremely arid periods are not taken into consideration. However especially this periods determine future yield of agricultural crops.

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229 - THE PRECIPITATION RANDOM VARIATIONS RELATION WITH WHEAT PRODUCTION AMOUNT IN THE ESFAHAN PROVINCE

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In this research, it was used thirteen climate and synoptic station in five-year period (2001-2006) that is being considered for random precipitation changes in Esfahan province. For consider random rain changes , first it was evaluate data in the models of random changes by statistical tests , then data was random and forecasted in models of accidental changes. The seasonal rain series of selected station had got completely random rain changes. In this research, data are considered in two types: constant and changeable models. and the relationship between random changes is analyses by the agricultural models of wheat product on thirteen township of Esfahan province. The amount of producing wheat follows the models of random precipitation in all townships and they were impressed with these models. On this basis, there is a powerful relationship between random precipitation changes and the amount of producing and the area under cultivation of wheat. This subject is showing the importance of the advancing and training the temporal climate changes to determine agricultural models from every area.

Keywords: Random precipitation , seasonal precipitation , agriculture models

235 - ASSESSMENT OF THE POTENTIAL IMPACT OF CLIMATE CHANGE UPON SURFACE WATER RESOURCES IN THE BUZU AND IALOMITA WATERSHEDS FROM ROMANIA IN THE FRAME OF CECILIA PROJECT

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This paper is a subject of a stage within the scope of European Project 037005 STREP FP6 - CECILIA ("The assessment of impact and vulnerability of climate changes in the Centre and Eastern Europe"). The aim of tis project is to assess the impact of climate changes from the regional scale to local scale of Centre and Eastern Europe area, pointing up a very high climate resolution usefulness for catching the effects due to the field complexity of study area. The warming of the global climate caused by greenhouse effect can induce essential changes in the hydrological regime and water resources at a different time and space scale.

Water balance modelling with regard to climate change scenarios can give substantial information on changes in the hydrological situation in the future. Water-balance models are especially useful for identifying the regional hydrologic consequences of changes in temperature, precipitation, and other climatic variables.

The aim of the present research is the determination of the impact of possible climatic change in the 21st century upon surface water resources in the Buzau and Ialomita river basins, using the WatBal water balance model.

The analysed river basins covering an area of 14392 km- are located of the outside of Curvature of the Carpathian Mountains, in an area where the altitude varies from 50 m to 2500 m. In accordance with the altitude, the annual precipitation varied from 400 mm/year in the plain area, to 1400 mm/year in the mountain area and the evapotranspiration between 850 mm/year in the plain area, to 500 mm/year in the high area too. On the other hand, due to a very high variability of weather conditions, droughts as well as excessive humidity periods occur during the year.

WatBal is an integrated water balance model developed for assessing the impact of climate change on river basin runoff. This model has essentially two main modelling components. The first is the water balance component that uses continuous functions to describe water movement into and out of a conceptualized basin. The second component is the computation of potential evapotranspiration. The model input components are: precipitation, air temperature, relative air

humidity, wind speed, sunshine duration, net radiation, albedo and historic discharges (only for calibration of model parameters). The output components are: effective precipitation, potential evapotranspiration, total modelised runoff (direct, surface, subsurface runoff and base flow) and relative depth of water reserves in the basin.

Monthly data series of 7 meteorological stations and 2 runoff gauging-stations on the period from 1961 till 1990 have been used for calibration of the WatBal model in the local conditions of this area.

The values of the modification of the air temperature and precipitation, in the selected analyzed catchments, in the hypothesis of the double amount of the CO_2 in the atmosphere for the reference year of 2075 were determined with the regional climate model RegCM. This model has been used recently to examine climate variations at scales that are not resolved by global models. To the extent that it produces realistic climate simulations, such a model can be a powerful tool in the study of regional climate impacts.

Finally, in the paper, the values of mean monthly discharges at Slobozia gauging station on the Ialomita River and Racovita gauging station on the Buzau River, estimated in above-mentioned hypotheses, are presented.

Keywords: Cecilia Project, climatic changes, Watbal model.

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240 - ANALYSIS OF WINTER CLIMATOLOGICAL PARAMETERS IN RILA MOUNTAIN

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Mountain climate is one of the essential factors influencing tourism, which is the very important field of economy. Tourism is important also for human entertainment, relaxation and recreation. Due to natural advantages mountains are attractive for different recreational and tourist activities and therefore should be used by man as much as possible.

In winter risks related to human body overstrain due to cold increase in this season. In the case of a healthy man, a stay in mountains in this season improves all biochemical processes in human organism due to intensified blood circulation and respiration. That is related to such sport activities like skiing and sledding.

Recreation of this type is possible if snow cover depth exceeds 20-30 cm for good skiing conditions. Temperature and sunny conditions were found to have the greatest influence on tourism, too.

The climate fluctuations have the potential to affect tourism. Understanding of these relationships can be an important tool in understanding the sensitivities and vulnerabilities of the industry to climate change.

In this paper some of climatological parameters in Rila mountain, which show weather regime in winter, are investigate. The following parameters were chosen: numbers of sunny days, days with snow cover, very cold and ace-cold days, length of period with snow cover. The series of winter values were analyzed to distinguish climatic variations and trends provided by natural factors.

Keywords: snow cover, winter climate, tourism, Rila mountain.

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253 - DETERMINATION OF SEDIMENT LOAD AND SEDIMENT ESTIMATION IN THE ÇAYGÖREN DAM

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Çaygören dam on Simav River in the Northwest Turkey was built for flood control, and to obtain drinking water, and water for industrial usage. The dam was completed in 1968 and its height from stream bed is 52,50 meters, its lake capacity in normal water level is 130 hm^3 and its lake area in normal water level is 7,25 km^2. Dam supplies irrigation water to 17208 hectares of agricultural area and 1hm-/year drinking and usage water to the settlements and industrial plants and in the basin. Hydroelectric power plant station was built on dam to produce electricity in May 2006.

The material which was eroded and transported by the fluvial processes causes siltation in the dam lake. In this study, it is aimed to specify the changes in water level and lake area due to siltation. In order to determine the spatial and temporal change of Dam Lake, different dated 1:25000 scaled topographical maps; water level measurement data and Landsat ETM+ 2006 satellite image taken from multispectral sensors were used. 1:25.000 scaled topography maps were scanned and transferred into computer and coordinated (European Datum 1950 - UTM Zone 35N). Dam lake area and topographic features were transformed

into layers by screen digitizing method on coordinated topographical maps. We used bathymetry maps 1968 and 2003 to generate DEM to find out the changes in the ground topography and the water volume of the dam lake. Moreover, topographical maps were used in geometric verification of satellite image. ArcGIS Desktop v.9x software was used for these processes.

In result of implemented processes, it was determined that the water holding capacity of the dam decreased due to deposition and siltation during the period between 1968 and 2006. In priority, the siltation threatens eastern part of Dam Lake and it is narrowing down from the east to the west. The changes in the water level of the dam have resulted from extensive sediment delivery and siltation processes.

Keywords: Çaygören dam, sediment delivery, siltation, GIS, water level

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255 - EFFECT OF SOME AGROTECHNICAL PRACTICES ON HUMIDITY REGIME OF THE SOIL AND PRODUCTIVITY OF THE MAIZE

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The effect of some agrotechnical factors on humidity regime on the Vertisol and productivity of the maize is investigated in complex field trial. Various variants are recommended for fertilization level, soil tillage and compacted with winter pre - crops.

It was established that the companion of the maize field with winter pre - crops decrease the values of night and day evapotranspiration. The effectiveness of 1m3used water is highness in compacting with perko, soil tillage with loosening and direct sowing of the maize field, specifically for the soil climatic of the region. The average maize productivity for the trial period is highness with loosening rather than direct sowing. The maize yield decrease if the winter pre - crops companion is used.

Keywords: winter pre-crops, soil humidity, evapotranspiration, soil tillage.

257 - ASSESSMENT OF THE IMPACT OF THE CONTEMPORARY CLIMATIC CONDITIONS ON THE REGIME OF THE UZUMCU RIVER (WESTERN TURKEY)

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This study aims to analyze and determine the impact of the climatic conditions on the regime of the Üzümcü River in the Susurluk basin on the northwest of Turkey. We also evaluated the geographical properties of the basin that affect on the discharge of the river. Üzümcü is a tributary of the Susurluk river which flows to the Sea of Marmara. The Üzümcü River originates from the Sogucak plateau which is 800 in altitude and flows to the Simav River. The river has very high fresh water potential and is considered to be an important water source for the Balikesir city which is population is over 250000. The river is 75 kilometers long and the total area of the basin is 521.5 km². The altitude on the source area is 762 meters (Kertil peak) and 100 meters in the confluence to the Simav River. The catchment area is an erosional surface and take place on a plateau constituting from Miocene, Pliocene old volcano- sedimentary formations and volcanic rocks. Oaks (Quercus cerris, Q. infectoria) are common plant species in the basin.

There is very intense erosion due to land use practices and clearance of the natural vegetation on the higher parts of the study area.

In order to determine the changes in discharge and regime of the Üzümcü river long rainfall, temperature, and discharge data obtained from Turkish State Metrological Service and State Hydraulic Works have been analyzed. The data on temperature, rainfall and discharge have been transformed into graphics and table in computer using ArcGIS Desktop v.9x software. The analysis of the climatic (rainfall and temperature) and discharge data of the river has indicated that increase in rainfall cause increase in discharge in the period between January and April when the soil is saturated. But surface runoff decreases in the period between October and December just after the dry season when the soil is not saturated.

Keywords: Üzümcü River, discharge, rainfall, river flow regime

265 - CLIMATE CHANGE, DROUGHT AND OVER PUMPING IMPACTS ON GROUNDWATERS: TWO EXAMPLES FROM TURKEY

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There are 25 main river basins in Turkey. Konya Closed Basin (KCB) and Kucuk Menderes River Basin (KMRB) are 4th and 24th biggest basins according to their precipitation areas which are 53850 km² (approximately 7% of Turkey's area) and 6907 km², respectively. These two basins have been selected to show drought effects on basins which have different size and climate (continental and Mediterranean climate conditions prevail in KCB and KMRB). In Turkey, there are 33449 wells drilled only by State Hydraulic Works (DSI) and over 4285 and 400 (in operating) of them are in KCB and KMRB, respectively. Global warming and climate change perceived by all over the world also affect our country. Besides global warming, it has been considered that low precipitation especially in the KCB (country and KCB's average precipitations are 643 mm/year and 300-350 mm/year, respectively) and unregistered wells in both basin cause excessive drawn downs of ground waters (GRW).

Aim of this study is determination of relation between precipitations and GRW's levels, and clarification of the excessive GRW drawndowns' reasons in the basins. For that purposes, precipitation values measured at gauging stations' having long-term data and GRW's levels which are measured by DSI have been compared and cumulative deviations graphics of precipitations have been evaluated. Although two basins have different climate type, precipitations data evaluations for both basins have indicated that a dry period (or drought) has prevailed in these areas since 1980's years. After that time, GRW's level drawndowns have been observed together with dry period in the basins. Unnatural decreasing rate of GRW's levels change reached to ~90 cm/year in both basins. Due to impossibilities of the direct intervention in drought, it will be possible to lessen of these excessive GRW's drawndowns by modernization of irrigation systems, preventing of unregistered wells and savings of water.

Keywords: Basin, Drawdown, Drought, Groundwater, Precipitation, Turkey

268 - SOIL MOISTURE AND HUMIDITY INFLUENCE ON THE WHEAT YIELD

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Pot experiment with 9 varieties wheat Sadovo 1, Galateia, Millena 3, Lazarka, Boliarka, Slaveia, Iveta, Aglika, Neda and 3 variety lines III 18-93/214-6, II -17-97/52-2, 93/223 and the control variety Sadovo 1, treated by humate fertilizer "Humussil" on leached meadow - cinnamonic soil from experimental base Tzalapitza, Plovdiv region.

Two soil moisture regimes were realized: 40 and 70% FC in glass house under real humidity and the third variant under soil moisture regime 40% FC and air water deficit /humidity 35 %/ in climatic chamber from flowering to the experiment end /full ripeness/. All variants for every variety were in 5 replications.

Plant height and grain yield per a pot were evaluated. The plant height at 70% FC soil moisture regime were the highest for Milena. Soil moisture deficit decreased plant height the most for Galatea, followed from Sadovo 1, Aglika, Boliarka(the ratio plant height at 70% FC/ plant height at 40% FC changed from 1,96 to 1,6). No relation between plant height and grain yield per a pot. The same ratio for grain yield per a pot was the highest for Galatea, Aglika, Milena. Air water deficit in the phytochamber decreased the plant height for Galateia and it was the highest for Aglika and Iveta and the grain yield was the highest for Galateia and Iveta and the lowest for Aglika and the variety line II 17 97/52-2.

The applying of humate fertilizer "Humussil" increased the plant height and the grain yield per a pot.

Keywords: soil moisture, humidity, variety, grain yield, plant height

273 - THE HUMAN COMFORT CONDITIONS ALONG THE BULGARIAN BLACK SEA COAST IN THE END OF 20 AND BEGINNING OF 21 CENTURY

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In the process of integration of Bulgaria in European Community the tourism became one of the main branches of economy. In order to determine the sustainable development of the tourist industry and to answer the needs of fast and expansive development of tourism in Bulgaria it is necessary to have detailed information about the climate potential and the length of the tourist season. The aim of this work is to estimate the human comfort conditions in Bulgarian Black Sea coastal area. The analysis is based on the daily data from Varna, Burgas and Ahtopol meteorological stations.

The aim of this work is: to estimate the human comfort conditions in Bulgarian Black Sea coastal area at the end of 20 and the end of 21 century.

Different indexes such as SSI, THI, PMV and PET have been used to determine the human comfort conditions. The results show that the region of the Bulgarian Black sea side is suitable for tourism and sport activities from April to October.

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274 - THE ESTIMATION OF BIOCLIMATIC CONDITIONS IN PART OF BULGARIA AND FINLAND USING DIFFERENT HUMAN COMFORT INDEXES

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Climate deeply in many wais affect mankind and human activities. Air temperature and humidity, surface wind and radiation balance components are the major parameters of the atmospheric environment determining the bioclimatic conditions which are one of the important features of the urban environment. Citizen of most

European countries as exceptional long and cold has perceived the winter 2005-2006. At the same time the summer 2006 in Finland was exceptional warm and dry.

The aim of presented work is to analyze the human comfort conditions in Sofia and Helsinki during the winter period 2005-2006 and summer 2006. As a tool for assessment of the level of human comfort/discomfort conditions the new wind chill (WCI), PVM and PET indexes has been used. The diurnal variability and the features of thermal comfort have been analyzed.

The hourly air temperature wind speed and relative humidity from the automatic meteorological stations (AMS) in a region of Sofia and Helsinki have been included in analysis.

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275 - AN ESTIMATION OF THE GLOBAL SOLAR RADIATION OVER BULGARIA

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The sun is the main source of energy for life on Earth. That is why some knowledge of the distribution and amount of solar radiation has a great importance to people and economy. As well, during recent years there has been, due to the growing interest in solar energy as an alternative source of energy, an increased effort in the study of solar radiation. Information about solar radiation is needed for the design of heating and cooling systems for homes, livestock structures, greenhouses and other buildings. Many models calculated evapotranspiration, heat budget and plant growths also require solar radiation data.

In this study a statistical analysis of total solar radiation were made. The monthly average daily solar radiation on horizontal surface in some stations was estimated using sunshine duration, cloud cover, maximum and minimum air temperature. These parameters were input in some radiation models to compute the solar radiation. A series of daily measurements of the global solar radiation on a horizontal surface recorded in Sofia, Sandanski, Chirpan and Pleven were used. The annual variations (mean monthly values) show that from January to June there is a slow increase compared to the more rapid decrease from summer to winter. Some statistical characteristics as mean square deviation, skewness, kurtosis were evaluated. Finally, an estimation of the total solar radiation from climatological data in the Bulgaria area has been attempted. The estimated values have been compared with the corresponding measured values. Calculations and measurements were found to be in rather good agreement

282 - STANDARDIZED PRECIPITATION INDEX AND CROP PRODUCTION IN REPUBLIC OF MACEDONIA

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There are several indices used to evidence drought occurrence. Some of them are widely accepted and used in the practice (for example, the Palmer Drought Severity Index has been widely used by the U.S. Department of Agriculture). Each of them has its advantage and disadvantage. Unfortunately such indices are not in wide use in Republic of Macedonia, even though drought is very frequent and most common limiting factor of crop yield. The use of newer indices such as Standardized Precipitation Index (SPI) is very rare in R Macedonia although it was developed 15 years ago and is one of the most popular for detecting drought and flood events. It is important that the SPI can be computed for different time scales and provide early warning of drought and help to assess drought severity, and is less complex than the Palmer. These characteristics are good reason to use it in the country due to lack of input data for using some of the other indices.

SPI different time scales reflect the impact of drought to different water resources availability. Soil moisture conditions respond to precipitation anomalies on a relatively short scale. Groundwater, streamflow, and reservoir storage reflect the longer-term precipitation anomalies. In this paper SPI is calculated from rainfall stations in Republic of Macedonia (for 3 and 6 months) and its value is correlated with crop yield in the same area. Obtained data show good capacities for using of SPI in the country.

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290 - DIGITAL APPROACH FOR ESTIMATING MONTHLY AND YEARLY CLIMATOLOGIC WIND DATA

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Wind is a meteorological element with changeable spatial and temporal

appearance, which occurrence and variation is crucially initiated by pressure gradients, as strongly affected by solar radiation, global and local atmospheric circulations, relief, etc.

With a purpose to optimally plan an established use of various types of constructions, one would essentially require wind speed and wind direction estimates. Wind assessment is particularly important when planning and performing activities related to localizing (forest) fires; it affects the biosphere in both physical and biological manner. Moreover, the global concern arising from environmental pollution and climate change has strongly emphasized the development and use of renewable sources of energy, amongst which wind is one with a huge potential.

Apart from those listed above, wind assessments are important for large number of other applications and informative goals. Therefore, it is crucial that wind data for a given region of interest is adequately processed and the final product is quickly received in a comprehensive format. Considering the large amount of data regularly received form an automatic and/or conventional measuring system, a digital application for simplifying the incoming data quick and easy is required.

The paper describes an application for processing, assessing and presenting wind data in a comprehensive, fast and sophisticated manner, unlike the conventional manual methods that were used in UHMR thus far. The application has been developed using Lotus and Microsoft Excel. With the aid of a few examples, the precision, potential use and importance of adequate wind assessment will be demonstrated.

Keywords: Wind, wind assessment, digital data processing

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299 - SOME CHARACTERISTIC OF PRECIPITATION AT SKALNATE PLESO

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In the last year a great attention is paid to the problem of the long-time variability of atmospheric precipitation because precipitation belongs among the responsive

indicator of climatic changes. A great attention is paid not only to the extremes anomalies of precipitation, but also to the reasons which cause these effects. Precipitation regime in Slovakia has been significantly changed in the 20th century. It was probably due to by changes in the atmospheric circulation above Central Europe. Possible changes in the air pressure fields above Europe and the North Atlantic in the 21st century can essentially influence the position and variability of the polar frontal zone as well as the general circulation patterns. This is a factor which determines many characteristics of the climatic system, including precipitation The aim of our study is an analysis of time series of atmospheric precipitation at Skalnaté Pleso (φ = 49° 12' N, λ = 20° 14' E, h = 1778 m a.s.l.) in the High Tatras. It comes to this, that the actual solution of the chosen problem is based on experiment. Based on the experimental data of precipitation (measurements are carried out 3 times a day in the climatic terms 7, 14, and 21 h) at Skalnaté Pleso during the 1947-2006 period the daily and annual sums of precipitation were calculated which served as a basis for the time series analysis. To estimate the trend of precipitation (q) with the time (t) (variable t denotes the corresponding year in the time series) the method of regression analysis was applied. In the first approximation a simple linear model was assumed and by the method of the least squares the regression coefficients were calculated.

By processing of the extensive material from measurements of precipitation during the investigated period many statistical characteristics of the number and amount of precipitation were obtained.

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301 - LONG-TERM METEOROLOGICAL MESOSCALE RAMS SIMULATIONS OVER NORTHERN ITALY FOR AIR QUALITY ASSESSMENTS

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Exceeding the air quality standards set by the European Union for ground-level concentrations of ozone and PM cause adverse effects on human health and vegetation. This is a well-known problem in Northern Italy, where high anthropogenic emissions and frequent stagnant metèorological conditions bring to very high concentrations of PM in winter and of ozone in summer.

Tropospheric ozone is produced through the photochemical oxidation of nitrogen

oxides (NOx) and volatile organic compounds (VOCs), while PM production and accumulation is driven also by emissions of primary particulate matter, sulphur oxides (SOx) and ammonia (NH3).

Peculiarity of the Northern Italy domain is the fact that the non-attainment of secondary pollution standards is not restricted to urban areas and often occurs away from cities, at mesoscale. For this reason, in a scenario analysis framework, it is necessary to evaluate emission control strategies considering accurate deterministic simulations performed with complex modelling systems. Furthermore, the simulations should cover for long periods, such as one year, in order to assess the air quality parameters following the EU air quality monitoring directives. These modelling systems are characterised by 3 components: emission models, meteorological models and chemical transport models.

Meteorological models are an important portion of deterministic modelling systems. In fact meteorological variables rule pollutants advection, diffusion, wet deposition phenomena, chemical reactions, multiphase dynamics etc- in Chemical Transport Models (CTMs). Mesoscale meteorological modelling runs for long periods (such as a year) and with high resolution in time (1 hour) and space (less than 10 km) require considerable computing resources.

Within an HPC-EUROPE (Pan-European Research Infrastructure on High Performance Computing) cooperation project at CINECA (Interuniversity consortium), Bologna (Italy) the meteorological conditions over Northern Italy were simulated using RAMS4.4 in parallel mode for the year 2004, creating a database for further air quality assessments.

First results of the study and comparisons between modelled and measured meteorological parameters are presented and discussed.

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308 - CLIMATE COMFORTABLE FOR TOURISM: A CASE STUDY OF CANAKKALE

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Climates that make a person healthy and dynamic can be defined as the comfortable climate zone. In other words, comfortable conditions are those that

require the minimum amount of energy to adapt to the environment. Climate comfort mostly depends on temperature, humidity, radiation and wind. In this study, climate comfort of Canakkale has been investigated in terms of tourism activities.

Canakkale, which is located in Northwest Turkey, has lands on the Canakkale Strait that separates Europe and Asia. Because of this feature, this region has utmost importance. The Canakkale city provides activities for tourism thanks to its rich natural and cultural features.

The Gallipoli Peninsula is one of the most important tourism areas due to its historical values and that is why part of it was declared as a historical national park. Another valuable asset of the Canakkkale region is the Troia antic city. The surroundings of this antic city was also declared as historical national park. In addition to these two significant areas, there are more tourism activities in Canakkale, such as Ida Mountain and Kavak Delta. These regions offer rich biodiversity in terms of plant life and wild life.

Evaluating tourism potential requires investigation of climate comfort. In this study, longitudinal climate data was used to investigate climate comfort of Canakkale for its tourism potential.

Keywords: Canakkale, Tourism, National Park, Climate comfort

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310 - REGIONALIZATION OF CLIMATIC HAZARD/RISK PHENOMENA AND THEIR ENVIRONMENTAL IMPACT IN BUCHAREST METROPOLITAN AREA

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By its position within the Romanian Plain (southern part of Romania) both the capital city Bucharest and its metropolitan area are exposed to several climatic hazards/risks with major impact on the environment. The article emphases in detail the occurrence and the amplitude of the hazard/risk phenomena of the cold semester (cold waves, blizzard, snow layer, frost and hoarfrost, glazed frost etc.) and warm semester (heat waves, rainfall, hail storms, strong winds, fog and acid rain etc.) within Bucharest Metropolitan Area.

The authors used and processed the annual and monthly mean climatic values

within the meteorological stations from the studied area between the years 1961-2005 in order to identify the main hazards/risks with direct impact on the environment quality reflected on the recorded damages which have affected the settlements (roads, houses, agricultural land etc.) and people. At the same time, on the basis of this survey we were able to realize two climatic hazard/risk maps for each semester (cold and warm).

The paper also analyses the synoptic conditions which have been generated the main climatic sequences within the studied area, considered as case studies: the heat waves of the summers of 2005 and 2007 and the amount of precipitation fallen in September 2005 as well as their environmental impact.

Keywords: climatic hazard/risk phenomena, environmental impact, Bucharest Metropolitan Area, Romania.

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340 - WINTER CONDITIONS VARIABILITY IN BULGARIA

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Winter climate variability plays a key role in a number of environmental and socioeconomic systems in each country. Understanding these relationships can be an important tool to evaluate the sensitivity and vulnerability of the ecology and industry of Bulgaria in a changing climate.

The present study is on the variability and tendency in the winter conditions during the last 75 years in the course of snow cover parameters - snow depth and snow cover duration as well as winter air temperature and precipitation. Extreme winter temperatures, annual sums of the extreme winter warm days and the number of winter ice days are also accessed. Data over the 1931-2005 period from major weather stations located in different climate regions of Bulgaria are used.

Winter conditions variability was studied by applying graphical and objective statistical methods. On the base of a seven-degree scale, applying as criterion the value of standard deviation (SD) of winter mean temperature for each consecutive class, the winters are analyzed and classified.

Keywords: climate variability, winter conditions, Bulgaria, winter classification.

343 - STOCHASTIC ANALYSIS OF GLOBAL AND LOCAL CHANGES IN SOUTH EUROPE AND MEDITERRANEAN AREA

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Global climate changes have been a subject of many studies during the last decade, especially through formulation of various scenarios and analysis of possible effects of climate changes to water resources. Global climate changes are firstly simulated using the paleo-climatological methods and than using Global Climatic Models (GCM). Both approaches are based on the assumption of an increased concentration of carbon dioxide (CO_2) in the atmosphere due to a progressive exploitation of fossil fuels in the last Century. Another assumption in these approaches is global heating of the Earth's surface and the Atmosphere due to the greenhouse effect and depletion of the ozone layer. The greenhouse effect also contributed to the increased CO_2 atmospheric concentration, while the ozone hole contributed to the increased production of trace gases (mostly phreon). Connectivity of atmospheric vapor content with the oceans and land water movements imply introduction of Global Circulation Models (GCM).

Public is showered with the facts and proofs of the existence of global climate changes and with catastrophic predictions for the next 50-100 years if existing trends on fossil fuels use continues. On the other hand, nobody can predict temperatures and air wetness, rainfalls and runoffs for the next year or season, and what is expected: average conditions, floods or droughts- More than that, (and as other paradox), none of regional climate centers can produce weather predictions for the next 10 days, or expected rainfall amounts for the next 5 days. Rational explanation of those paradoxes, based on process scale problem is given in this paper.

It is human to worry about Earth's future and sustainable development of future generations, but for the actual generation crucial question is: How to plan and design water resource systems, and haw to make usable predictions and forecasts for the water management purposes in changed conditions- That question is practical, and it implies dilemma: Are existing methods (based on probability or deterministic model) are still usable, or new methods (based on nonlinear and no stationary stochastic models) must be introduced- Paper offers rational answer on that question.

Paper summarizes results of 15 years research on global and local changes based on the analysis of stochastic properties of hydrometeorological time series led by the first author of the paper and realized at the Faculty of Civil Engineering University of Belgrade.

Study of global changes is based on yearly precipitations long-series data sets. More than 20 representative stations from the South Europe and Mediterranean area are selected from FRIEND-AMHY database (H.Bendjoudi and P. Hubert, 1997). Local changes are studied on the basis of yearly and monthly long-series data for 7 climatologic characteristics in Belgrade. Besides, analyses of the discharge long series for one profile on the Danube River are included, as well as regional study of extreme runoff changes in Serbian transboundary and local catchments data.

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348 - INFLUENCE OF SOCIAL-ECONOMICAL CHANGES IN BULGARIA AT THE MANAGEMENT OF IRRIGATION SYSTEMS

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Water taking and water distribution networks are irrigation equipments requiring many investigations and long period of baying off, that have to be read at there reconstructions. Social economical changes in Bulgaria during last years have made taking measures with many vested interests. The values of these measures can prove equivalent to second time building on the already existed network. Economical validity decisions may be mixed, i.e. partial reconstruction as the parts of already built irrigation systems are used.

In irrigation practice the baffle distributors are used. The percentage of variations of water level allowed is defined from requested accuracy of regulated discharge, with mistake of +;-5% to +;-10% .

In these paper is analyzed the relation between water level and discharge at the downstream control.

Keywords: Irrigation systems, open canals, baffle distributors, downstream control

350 - THE APPLICATION OF CLIMATIC CHANGES IN ECOTOURISM STUDIES

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The climate is a component that has the most important role in ecotourism studies. Ecotourism and planning in ecotourism in every geographical realm is effective in climatic and climatic changes .One of the most important elements in climatic changes is precipitation variations that as one of the most important factors in ecotourism studies plays an efficient role . For study on climatic elements variations, change models are required to be used and classified on the basis of ecotourism features after the study. Then, on the basis of ecotourism and climatic abilities, they are classified.

Keywords: Climate, climatic changes, ecotourism, planning, geographical realm.

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351 - CURRENT INSTITUTIONAL SETUP FOR COMBATING LAND DEGRADATION AND DESERTIFICATION IN THE REPUBLIC OF MACEDONIA

Vladimir Stavric, Ordan Cukaliev, Ivan Blinkov, Katarina Donevska, Dusko Mukaetov

The international community has long recognized that land degradation and desertification is a major economic, social and environmental problem of concern to many countries in all regions of the world. It has been evident that the problem of land degradation in arid, semi-arid and dry sub-humid areas had lately intensified, especially in view of climate change and global temperature rise.

A new, integrated approach to the problem, emphasizing action to promote sustainable development has been adopted the 1994 UN Convention to Combat Desertification. The Republic of Macedonia ratified the UN CCD in 2002. The principles are fully accepted on policy level. However, even though implementation of some the Convention requirements have been enacted, they are not fully integrated in the national planning and management mechanisms. The reasons

for this current situation are analyzed in the paper.

Presently the Republic of Macedonia does not have coherent and comprehensive policy regarding land degradation and desertification issues, as defined by the UNCCD. Sectoral and medium specific policies connected with the issues of land degradation do exist and are formulated in various policy documents and strategies. Current institutional setup, both on national and regional/local levels, as well as legal framework has been analyzed in respect to UNCCD implementation requirements.

Fragmentation of responsibilities among key institutions and the practice of single-resource management of natural resources does not provide integrated approach for combating land degradation. The existing monitoring network and data management capacities need serious improvement. Finally, recommendations on possible modifications in allocation of responsibilities, of institutional setup, and legislation are proposed in order to raise the issues of land management on the decision maker's agendas.

Keywords: Land degradation, desertification, natural resources management

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352 - HUMAN INDUCED FACTORS WHICH GENERATE DESERTIFICATION, LAND DEGRADATION AND DROUGHTS IN THE REPUBLIC OF MACEDONIA

Ordan Cukaliev, Ivan Blinkov, Katarina Donevska, Dusko Mukaetov, Vladimir Stavric

The international community has long recognized that land degradation and desertification is a major economic, social and environmental problem of concern to many countries in all regions of the world. It has been evident that the problem of land degradation in arid, semi-arid and dry sub-humid areas had lately intensified, especially in view of climate change and global temperature rise.

A new, integrated approach to the problem, emphasizing action to promote sustainable development has been adopted the 1994 UN Convention to Combat Desertification. The Republic of Macedonia ratified the UN CCD in 2002. The principles are fully accepted on policy level. However, even though implementation of some the Convention requirements have been enacted, they are not fully integrated in the national planning and management mechanisms.

The factors that generate land degradation and desertification in the country have

not been thoroughly analyzed. Furthermore, these factors are not monitored systematically. This prevents creation of monitoring databases for following the processes of land degradation, thereby hampering informed and reliable decision making.

Factors that generate land degradation and desertification may be natural - including human induced on global scale (climate change, acidification etc.) or factors depending on the management of natural resources. This paper concentrates on analysis of human induced factors, such as climate (temperatures, precipitation, as well as climate changes), floods and droughts, erosion, acidification, alcalinization and salinization all in respect to UNCCD implementation requirements.

The regional susceptibility to land degradation has been analyzed and degradation prone areas initially identified.

Finally, the paper makes some recommendations for improvement of the research & monitoring, as well as for data management for decision making. Some actions are proposed, as part of the National Action Plan for Combating land degradation and desertification.

Keywords: Land degradation, desertification, natural factors, monitoring, manàgement

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353 - UNSUSTAINABLE PRACTICE IN THE MANAGEMENT WITH NATURAL RESOURCES AS FACTOR WHICH GENERATE DESERTIFICATION, LAND DEGRADATION AND DROUGHTS IN THE REPUBLIC OF MACEDONIA

Ivan Blinkov, Katarina Donevska, Dusko Mukaetov, Vladimir Stavric, Ordan Cukaliev

The international community has long recognized that land degradation and desertification is a major economic, social and environmental problem of concern to many countries in all regions of the world. It has been evident that the problem of land degradation in arid, semi-arid and dry sub-humid areas had lately intensified, especially in view of climate change and global temperature rise.

A new, integrated approach to the problem, emphasizing action to promote sustainable development has been adopted the 1994 UN Convention to Combat Desertification. The Republic of Macedonia ratified the UN CCD in 2002. The principles are fully accepted on policy level. However, even though implementation of some the Convention requirements have been enacted, they are not fully

integrated in the national planning and management mechanisms.

The factors that generate land degradation and desertification in the

country have not been thoroughly analyzed. Furthermore, these factors are not monitored systematically. This prevents creation of monitoring databases for following the processes of land degradation, thereby hampering informed and reliable decision making.

Factors that generate land degradation and desertification may be natural - including human induced on global scale (climate change, acidification etc.) or factors depending on the management of natural resources. This paper concentrates on analysis of some human induced factors, namely, the management of natural resources. The current management of natural resources in Macedonia encompasses: land (including soil) management, water management, forest, pastures, nature (protected & unprotected areas), and management of natural disasters.

The regional susceptibility to land degradation has been analyzed and degradation prone areas initially identified.

Finally, the paper makes some recommendations for improvement of the management practices, introducing integrated approach as well as improved data management for reliable and informed decision making. Some actions are proposed, as part of the National Action Plan for Combating land degradation and desertification.

Keywords: Land degradation, desertification, natural resources management, monitoring, decision making

354 - HUMAN SOCIO-ECONOMIC ACTIVITIES AS FACTORS WHICH GENERATE DESERTIFICATION, LAND DEGRADATION AND DROUGHTS IN THE REPUBLIC OF MACEDONIA

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The international community has long recognized that land degradation and desertification is a major economic, social and environmental problem of concern to many countries in all regions of the world. It has been evident that the problem of land degradation in arid, semi-arid and dry sub-humid areas had lately intensified, especially in view of climate change and global temperature rise.

A new, integrated approach to the problem, emphasizing action to promote sustainable development has been adopted the 1994 UN Convention to Combat Desertification. The Republic of Macedonia ratified the UN CCD in 2002. The principles are fully accepted on policy level. However, even though implementation of some the Convention requirements have been enacted, they are not fully integrated in the national planning and management mechanisms.

The factors that generate land degradation and desertification in the country have not been thoroughly analyzed. Furthermore, these factors are not monitored systematically. This prevents creation of monitoring databases for following the processes of land degradation, thereby hampering informed and reliable decision making.

Factors that generate land degradation and desertification may be natural - including human induced on global scale (climate change, acidification etc.) or factors depending on the management of natural resources. This paper concentrates on analysis of some human induced factors, namely, the human socio-economic activities. These include: agriculture, urbanization, industry and mining (quarries), solid waste generation and management and other activities.

The pressures of these activities and regional susceptibility to land degradation has been analyzed and degradation prone areas initially identified.

Finally, the paper makes some recommendations for improvement of the management practices, introducing integrated approach as well as improved data management for reliable and informed decision making. Some actions are proposed, as part of the National Action Plan for Combating land degradation and desertification.

Keywords: Land degradation, desertification, human, monitoring, decision making

355 - NATIONAL STRATEGY FOR COMBATING DESERTIFICATION, LAND DEGRADATION AND DROUGHTS IN THE REPUBLIC OF MACEDONIA

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The international community has long recognized that land degradation and desertification is a major economic, social and environmental problem of concern to many countries in all regions of the world. It has been evident that the problem of land degradation in arid, semi-arid and dry sub-humid areas had lately intensified, especially in view of climate change and global temperature rise.

A new, integrated approach to the problem, emphasizing action to promote sustainable development has been adopted the 1994 UN Convention to Combat Desertification. The Republic of Macedonia ratified the UN CCD in 2002. The principles are fully accepted on policy level. However, even though implementation of some the Convention requirements have been enacted, they are not fully integrated in the national planning and management mechanisms.

The objective of the National Strategy is to combat land degradation and possible desertification and to mitigate the effects of drought in the Republic of Macedonia.

This objective should be achieved through effective action at all levels, in the framework of an integrated approach and with a view to contributing to the achievement of sustainable development in affected areas. It will involve long-term integrated strategies that focus simultaneously, in affected areas, on improved productivity of land, and the rehabilitation, conservation and sustainable management of land and water resources, leading to improved living conditions, at national and in particular at the community level.

The elaboration of the proposed Strategy is based on adopted principles, the requirements of the UN CCD and the current development status of the country and it defines the time-frame and the financial requirements for achievement of the set objectives. Finally, the framework National Action Plan has been developed.

Keywords: Land degradation, desertification, National Strategy

366 - PLANNING FOR CLIMATE IMPACTS ON WATER RESOURCES

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It is clear from the latest reports of the Intergovernmental Panel on Climate Change (IPCC) that threats to water resources and consequential societal vulnerability are salient issues for regional and global communities. Not all world regions share the stark reality that climate change models largely agree on the direction of change in temperature and precipitation as does the Mediterranean Region and adjacent Balkan areas, particularly for the summer season, according to the regional climate projections of IPCC-4 Working Group 1. Models point to warmer and drier conditions, even though they might not agree on the magnitude of these changes. Prudent planning suggests assuming the worst and rejoicing if that assumption turns out to be short of reality.

In this paper, we draw upon examples of climate-change-related work on water resources in Bulgaria to argue that approaches to planning might be based on both quantitative and qualitative analyses, emphasizing the former while briefly suggesting the later. In quantitative analysis we suggest that there could be two stages of modeling climate change impacts. An exploratory stage would use simplified hydrological models with inputs from the results of general circulation model simulations using IPCC scenario assumptions. Such models could extend from the basin to regional and national levels and be used to scope such issues as the direction and magnitude of water resource impacts at various time stages, thus helping to direct the subsequent analytical stage to focus on critical places, issues and time periods. We use results from a simplified model for the Bulgarian Struma River Basin to illustrate the exploratory stage in detail. The subsequent analytical stage demands models of greater spatial and temporal resolution, using down-scaled GCM results. We outline the structure of such a detailed model for the Bulgarian Yantra River Basin, a model that also incorporates water quality dimensions. Finally, we argue that among approaches to societal vulnerability to water resource impacts, an approach using past and present drought as an analog may be more persuasive to the decision-making community than linked impact models of uncertain validity.

Keywords: Bulgaria, Climate Change, Drought, Struma, Vulnerability, Yantra, Water

370 - THE ROLE OF CLIMATE FACTORS IN NORTH ZAGROS RURAL SETTLEMENTS(KURDISTAN PROVINCE)

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In each place climate condition has the main role to determine activities sttelments and humanistic landscape. Reading scientific and technologic developments in communities, the role of climate factors in natural and humanistic environments not only became low but also their effectiveness and application for human being becom clear and living in cross of climate particularly in settlement and workplaces is in demand . the effect of climate and parametric climates on activities of rural and nomads communities in underdevelopmed regions including Iran is clear.e.g:the singes of climate limitations in face, texture, architecture ,forms, type and location of villages of zagros area including Kurdistan province is clearly seen 0/077 of Kurdistan province village are located in mountains location and in accordance to slope of earth and in stairs form.0/096 windowses are network and vertical.rooms are samall and 0/086 of rural settlement have less than100m².

Methodology of thise research was library documents and field study. The result shows that architecture is not match with climate of region.then the rural organizing in all settlement and social aspects is required.

Key word: factor climate, settlement, Kurdistan,zagros, rural.

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371 - PROGNOSTICATION OF SOIL LOSSES DUE TO THE WATER EROSION ON SLOPES

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In the paper are discussing the process of soil erosion due to the surfaces water flows on a slope terrain with accounting of a pulsation feature of the erosion velocities. In this aspect the problem of erosion process based on pulsation flow

with non regular alteration of the velocities have not enough clarification.

In this investigation work are shown analitical regularities based on erosion function of the velocities of pulsation water flow in interaction with resistance ability of soil. As a results are given analytical regularities into a function of average features of flow which helps for prognostication of the volume of erosing soils.

Keywords: hydrodynamics, water erosion

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385 - REGIONAL MODEL OF SUSTAINABLE UTILIZATION IN MARGINAL LANDS BY AHP METHOD (CASE STUDY: KABUDE OLIA IN KERMANSHAH PROVINCE)

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The determined model by AHP method for optimize utilization in marginal land can be effective for sustainable development in agriculture and renewable resource. The aim of this study determine of suitable model for sustainable utilization in marginal land according to present using. This study performed in Sarfirouze Abad rangelands in Kermanshah province (47°06'-47°12'E and 34°15'-34°25'N). It has the highest elevation watershed in Iran at 1450 m above sea level. The climate is a temperate semi-arid one with an average annual precipitation of 350 mm, a mean annual temperature of 12°C and slope 12%. The textures of the dominant soils are mostly loamy-clay. The factors were measured such as; soil erosion, canopy cover, ran off, biomass, diversity, macro and micro elements, wild life, landscape, seed bank and so on. The dignity of measured factors determined that soil erosion, canopy cover, run off, Biomass, diversity, organic matter and seed bank are importance respectively compared to other factors in sustainable development in marginal lands. By this dignity of factors and multiple with measured factors in field, then determine an SU Index. This index introduces area to danger of non sustainable utilization. Range of this index is 0-SU-1. If number of this index near to 1 that means utilization is good and trend going to sustainable, converse, if number of this index near to 0 that means utilization is

not good and there is threat of non sustainable utilization in marginal lands.

Keywords: Suitable Land Use, Marginal Lands, AHP Method, Modeling

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391 - SEISMICITY AND GEODYNAMICS OF MACEDONIA AND SURROUNDINGS

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This is a summary of the investigations of the authors and their coauthors published during the last decade. It shows the knowledge and the common views about the seismicity and the geodynamics of the South Balkans and the Aegean region. This is not the full reflection of the previous research and results made on these areas by different authors. The aim of this study is just to show the results and possible applications to the seismic hazard assessment related to Macedonia. The area is extensively investigated by many authors and different views and interpretations have been expressed (McKenzie, 1972; Papazachos, 1966; Ranguelov, 1987; Vannicci, 2004, etc.). Our aim is just to focus on some summary results and their internal relationships. On this base conclusions about the practical applications are done.

Key words: seismicity, neotectonic, earthquakes, GPS measurements

TOPIC 2

WATER BALANCE AND HYDROLOGICAL REGIMES

101 - WATER RESOURCES OF DRINI I BARDHE RIVER BASIN, KOSOVO

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In the present day world, the problems of too much, too little or too polluted water are increasing at a rapid rate. These problems have become particularly severe for the developing countries, adversely affecting their agriculture, drinking water supply and sanitation. Water recourse management is no more just a challenger it is a declared crises.

Water resources in Kosovo are relatively small, total amount of water in our country is small around 1600m³ / inhabitant /year. Territory of Kosovo is separated in four river basins: Drini i Bardhë, Ibri, Morava e Binqës and Lepenci.

Drini i Bardhë river basin is in the western part of Kosovo, it is the biggest river basin with surface of 4.289 km². Drini i Bardhë discharges its water to Albania and finally to the Adriatic Sea. The area consist of several small stream from the mountains, water flows into tributaries and Drini i Bardhë river. The mean run-off in the area is 141 l/s/km², but it varies considerably (5 to 50 l/s/km²), precipitation varies from 600 to 1400 mm/a.

Protecting from pollution is a very important issue having in consideration that this river discharge it's water and outside the territory. Hydrometeorology Institute of Kosovo is in charge for monitoring of water quality.

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125 - LAND COVER/LAND USE CHANGE IMPACT ON SURFACE RUNOFF IN SMALL CATCHMENTS

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Land cover/land use is one of the influencing factors when it comes to catchment runoff hence it is necessary to carefully consider both spectral and spatial

characteristics of the sensor and accuracy of representative areas of predefined classes. Due to satisfying accuracy of land cover/land use classification on a regional scale, the classification was done using Landsat ETM image along with the orthophoto of the study area. Definition of the future land cover/land use scenarios was based on existing conditions analysis in terms of existing erosion rate and anthropological influences as the area is very interesting from the energy production point of view as well as the agriculture. Results of the analysis confirmed the assumption of the adequacy of remote sensing methods applied not only in terms of land cover/land use classification but also as a tool in complex erosion rate analysis.

Keywords: land cover/land use, runoff, Landsat ETM, orthophoto, erosion rate, anthropological influence

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157 - RUNOFF IN THE BROEDLEAVED FORESTS OF PETROHAN

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More than a half part of runoff in Bulgaria was formed in mountain watersheds. In this respect the studies on the characteristics of the runoff are very important. In this paper some runoff characteristics in the hydrological station Garameshtiza are determined in dynamics. The fluctuations of the water amount, module of the watershed and some other features are presented for the period 2004-2007.

The runoff of four partial watersheds was estimated along with forestry characteristics of the broadleaved forests there.

Keywords: hydrological regime, climate, runoff, rainfall.

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158 - GENERAL STUDIES CONCERNING THE STATE OF RESERVOIRS

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Water is a natural, vital, vulnerable, regenerating and limited resource, a resource that needs to be handled very careful in order to be left as an inheritance for

the next generation. The aquatic ecosystems need a certain water quality and quantity in order to survive.

The vulnerability aquatic ecosystems, of the especially the pressure the local waters are under, resulted in water raising quality and quantity, all these reaching to the necessity of adopting a legislation that would balance the ecological quality.

This paper presents the structures of the artificial waters in the Banat Catchments Area, structures that were strongly modified; we also have their definition and description according to the E.U. Water Framework Directive, and at the same time we have their requests concerning the Management Strategy for this structures; lake typology and reference conditions; lake current estate and evolution of the pollution with organic substances, nutrients and prior substances or prior dangerous substances. In the second part of this paper there is presented as a study case "The accumulation of Three Waters" from the Catchments Area from Banat. In this part there are reached the following topics: the abiotic methodology for defining Lake Typology, the abiotic characterization of the Three Waters Lake. There were also taken in to consideration the tracing and preventing measures concerning water quality and degradation for the adjoining lake basin.

Keywords: ecosystem, eutrophication, lakes, pollution, ecoton.

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159 - PECULIARITIES OF NATURAL GROUNDWATER RESOURCES FORMING IN PIEDMONT AREAS UNDER SIGNIFICANT ANTHROPOGENIC IMPACT

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Natural groundwater resources are understood as groundwater flow for a long-term period and characterize the natural productivity of aquifers that is constantly renewed in the process of total hydrological cycle. For the practical application, assessment of natural groundwater resources shows the upper limit of groundwater withdrawal for a long-term period without depletion. The growth of anthropogenic load influence not only the quality of groundwater used for water supply of population, but mainly on peculiarities of its forming. This problem is very

actual first of all in piedmont areas where complicated geologic-hydrogeologic conditions cause the use of shallow aquifers and springs for water supply. They are considered to be the most vulnerable to any changes in the environment (both natural and anthropogenic).

In practice of hydrogeologic investigations a lot of methods for regional assessment and mapping of fresh natural groundwater resources (such as hydrometric methods, including hydrograph separation for a long-term observation period; hydrodynamic methods including mathematic modeling; water balance methods; experimental, and hydrogeological analogies) are used. The maps, compiled by these methods, can be used for assessing the perspectives of groundwater use for public water supply and forecast of its sustainable exploitation. The possibility of using of different methods of natural groundwater resources assessment and mapping in mountainous and piedmont areas is discussed for the region of the North Caucasus, Russia.

Keywords: groundwater natural resources, module of groundwater discharge, piedmont areas

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174 - A REVIEW ON GROUNDWATER MANAGEMENT ISSUES IN THE DRY ZONE OF SRI LANKA

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The value of water as a finite natural resource is becoming more and more highlighted, due to its depletion and pollution. Although the situation is equally appalling with both ground and surface water, the latter is given prominence merely due to the fact that surface water pollution is more visible. About 60-70% of Sri Lankans have access to a safe drinking water source, but only a mere 30-40% enjoy the luxury of pipe borne water. Still ground water is the major drinking water source for many rural areas of the country, and more importantly it's the major water-source of the rural-poor.

Issues related to ground water in the dry zone of Sri Lanka range from depletion of deep confined aquifers due to poorly planned tube well schemes to pollution of shallow unconfined aquifers due to leaching of chemical fertilizer. Large numbers of fluorosis case are reported from the North-western and South-eastern areas of the country owing to the geo-chemistry of the area. The ground water issues

are not only physical in nature; concerns are being raised by many experts in the country about the water rights of ground water aquifers in the already water stressed areas of the dry zone and possibilities of conflicts in future industrialization of these areas. The market liberalization policies adopted by the Sri Lankan government in the late 70s dramatically changed the resources utilization patterns of the country, little research has been done on the impact of these shift in policy on the dry zone groundwater resources.

This paper highlights the present day issues related to the management of groundwater in the Dry Zone of Sri Lanka and critically review the institutional roles with regard to this. It also focuses on the groundwater issues created by the Tsunami disaster of December 2004.

Keywords: groundwater, water stress, groundwater contamination, institutional roles

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183 - WATER REGIME OF COMMON BEECH (FAGUS SYLVATICA L.) IN DRAINED TERRAINS

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The beech forests in the region of the West Balkan Mountain have the highest productivity for the territory of Bulgaria. This is based not only on the genetics features of the different native provenance, but also on the good hydrological and thermal conditions in this region. A cascade of installations was built up in the medium of the last century for catching of the water flow. These installations drain the great part of the woody stands in this region. As a consequence the water regime of trees is worsen. The higher water deficit of the soil substrata makes more similar the physiological parameters of the leaves from the different part of the crowns.

In order to find out of this phenomenon, the rate of leaf transpiration was measured in two crown positions of young beech trees by infrared gas analysis. The results obtained were estimated in relation to the peculiarities of sunny and shady leaves.

Keywords: water regime, transpiration rate, water deficit, drained terrain.

186 - HYDROLOGIC REGIME AND INUNDATION FLOODS IN THE LEZHA CATCHMENT

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The city of Lezha and its surrounding villages, with a total area of 314 km², are included in the basin of rivers Drin, Gjader, Manati, and Kanali I Ujerave te Iarta.

Traditionally, the city of Lezha and the surrounding agriculture land had got frequent flooding associated with big economic damages. The reason is the insufficient transporting capacity of the main channel of the Drin of Lezha and the overflow of the Manati tributary in the low land of the city.

In such condition, without the necessary data of the recorded discharge in the hydrometric station of Drini river in the bridge of Lezha City, the evaluation of the hydrologic regime of the cachment area was carried out based on the rainfall data recorded in the climatic station of this catchment.

The analysis of rainfall data for different duration and return period served in the transformation of the flow in some axes of the hydrographic network of the catchment area.

The evaluation, particularly of the maximum discharge with different return period was carried out by some methods, where the best it was the method of the water balance which take into consideration also the storage of the river bed.

The main task was the solution of the inundation problem for a specified return period that according to the conditions and the criteria in our country was admitted 2 % for the agriculture land and 1% for the urban area of the Lezha city. The discharges used for verification were admitted respectively 1% and 0.1% .

By means of maximum discharge mentioned above for steady and unsteady flow was dimensioned the cross sections of the flow in the hydrographic network, taking into consideration factors such as: roughness of the channel bottom and banks, water level below which we don't have inundation, influence of delta river.

Keywords: catchment area, rainfall, discharge, return period,inundation, steady and unsteady flow.

187 - FUNCTIONING OF THE DRINI I LEZHËS RIVER IN THE ABNORMAL CONDITIONS

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The length of the Drini i Lezhes river from the village Gjader until the river mouth in Adriatik Sea is 22.6 km. This river collect all waterfall of the Lezha region.

In this study are shown four main impacts that influence in the water flow of this river. The level of the sea changes due to the wind in direction of the river mouth, causing changes of the water free surface level in the river with the risk of flooding. Filling of the river mouth of Drini Lezhes with solid sediments that are coming from the river and from the waves of the sea too is very important in the water regime of the river, and especially in that of the water free surface in the whole river length.

Another aspect is the influence of the roughness of the river banc that often happened in the case of the plane rivers because of the vegetation in bancs and the bottom of the river. For this reason the water system is calculated with the Saint Venan equation eliminating the inertia, kinetic and wind slope and accepting the piesometric and open flow bancs slope that dominates the water system.

The effect of the wind in the water surface is treated in function of the wind velocity and its slope and including the friction wind coefficient.

Considering the above aspects is given a good idea about the situation of the water free surface in the Drini i Lezhes River from which is depending the risk of flooding.

Keywords: Water system, Water free surface, Water regime, Flooding Slope, roughness

193 - BASIC CONCEPT FOR WATER BALANCE ASSESSMENT IN SERBIA

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This paper presents the basic characteristics of a developed concept for water balance assessment in Serbia. The starting point is a baseline water-balance equation which reflects all water inputs into a specific catchment area and, following the inclusion of all output and return components (water abstractions and discharges), available water resources are obtained for a given territory during the discretization period of time. Specifically, the entire territory of Serbia has been divided into nineteen water balance units to which the established water balance equations apply. The paper highlights interactions between water balance units. Procedures for the definition of individual components of an established water balance equation are presented at the end of the paper.

The paper illustrates a practical example in which the developed concept is used to assess the water balance for a water balance unit within the territory of Serbia.

Keywords: water balance assessment, water balance unit, water inputs, water abstractions, water returns, water discharges.

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251 - HYDROGRAPHIC CHARACTERISTICS AND WATER POTENTIAL OF KAZ MOUNTAINS (NW TURKEY)

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In this study, hydrographical properties and water potential of the Kaz Mountains (Mt. Ida) were assessed. Kaz Mountains (1012 km²) are the most important range in Biga Peninsula (8140 km²) which is situated on the northwest of Anatolia. The Paleozoic and Mesozoic rocks form up the base of the mountains. These rocks were overlaid by igneous, sedimentary rocks belonging to Neogene and

quaternary periods. The rocks were deformed due to tectonic activities. The area receives about 800-1000 mm rainfall in a year. So that; the suitable geological, geomorphological and climatic conditions increase the ground and surface water potential of the Kaz Mountains. The most important surface waters of Kaz Mountains are; Havran, Edremit, Zeytinli, Kýzýlkeçili, Manastýr, Mýhlý, -ahindere, Tuzla, Karamenderes, Biga and Gönen rivers.

The area has fresh water, mineral water, hot water (thermal) sources besides the ground waters. In this paper, formation of these water resources were studied and discharge, temperature, chemical and physical properties of the surface and ground waters were assessed. Kaz Mountains' spring waters are classified into two categories. One is the spring waters which has high pH and coming out from carbonated rocks. The second is the spring waters coming out from softer rocks. Discharge of the firs grup spring waters are higher then the second category.

Derman (1 l/s), Güre (10 l/s), Küçükçetmi (6 l/s), Külcüler (2l/s) ve Hýdýrlar (8 l/s) are important water sources in the area. The discharges of these water sources are about 10 l/s and temperatures are between 40-85°C. Dominant chemical combination of hot waters is NaSO4. Kaz Mountains have an important water potential and it will provide an advantage against global warming and drought problems in the future.

Keywords: Mt. Ida, water potential, ground water, rainfall, Turkey.

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362 - THE SIMULATION GEOLOGICAL & ENVIRONMENTAL FOR WATER SHORTAGE FROM JIFARA PLAIN BASIN NORTHWEST OF LIBYA

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Libya is among the countries suffering surface water supply shortage Due to scarcity of rain and snow era, and the formation mature, the vast Libyan lands (1.700.000 km) of which 95% arid lands, in this study our focus will mainly be on Jifara blain basin with such a complicated geological formation higher to the south and lower to the north with extreme slop towards the sea, this area was exposed to cleave movement resulted in two fractures, the first fractures heading north-east toward Tunisia borders as for as Jabal Abu-kirsh , 100 to 200 meters , the second fracture is heading west and called , the greater Azizia elevate , such movement led to fold and slop towards the sea forming three rock units :

1 - Mountain front sequence extending from homes to missiles to the west where it includes gargarish formation constituting sand lime sediments, such sediments formed water reservoirs of great subterranean water reserves.

2 - Mountain front sequence extending east and west to Tunisian borders, this line of sequence includes Abu-gailan and Abu-shaiba being covered by sand and limestone soil sedimentary containing underneath lime sediments it is around 700 meters over sea level, this formation also contains deep and wide gulfs including Mjineen and Essirt valleys being the main feeder to most north west area.

3 - Hadba surface sequences include the 4th era formations scattered in most edges and centre of the area with rock masses in which much low water exists.

It is believed that such rock units moved back to its present place by reason of different erosion factors, the basin is believed to be covered by lime and sand rock that led to the birth of lime water accumulations reaching 2.4x1610 km^3. Also the occurrence of low level water reservoirs scattered in the centre of the basin which was exposed to up and down and fracture movement contributed to the lowering of the north part of the basin most parts of this basin have been flooded by sea water during the Miocene and Oligocene resulted in the formation of rock Hollows consisting large quantities of water most of which are accumulated in the sea it is also believed that there is a large water basin branching from Jifara plain, it is also believed that the low level in the underground reservoirs is attributed to the low level of the north part of the basin where water flows from the south part towards the lower north part to flow into the sea water forming fresh water reservoirs inside the sea if we examine the way taken by water during the water cycle we find the movement indicates that it originates from sea to land , then land to sea again , once again it is believed that most countries will produce fresh water from sea in future as a result of water cycle of water returning to its original source.

The 4th era sediments are considered to have contributed to the basin surface and underground features formation during Holocene containing water carrying sediments such as Quaser El-haj formation consisting of lime and grain rocks where reservoirs of Al-Azizia Abushaibs and Abu-Ghailan are located where water is being pumped from Miocene layer as well as gargarish Formation which contains Ber El-Ghanam and kikla reservoirs that are covered by lime sediments, water is being pumped towards south of the basin, the south area of the Jifara plain. there are also saline sediments being spread south and west of the basin such salineâ--s were as result of dropping of Oligocene the matter which led to the salinity of the soil by effect of infiltration of salts contained in the rain water by this study we expect to find a trace of water flow from Jifara plain, towards sea, through a hollow in its north part, this matter resulted in creation of severe water shortage in the area.

In this study, it is proposed that 3D three dimension surveys be carries out in the basin to find out the geological structure which led to this natural phenomena

resulting in deformation to the installation of water distillation units for the purpose of refilling of such underground water reservoirs for the increase of its pressure and water reserve and increase of pressure

368 - LOW FLOW ESTIMATION IN THE RIVERS OF ALBANIA

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There is a wide variety of low flow measures which describe properties of the flow regime. These include the flow duration curve, flow frequency curve, low flow spells, deficiency volumes etc.

Where reliable river data are available at the site of interest these measures can be derived directly from the observed data. However, in many situations no flow data is available and, hence, techniques have been developed to estimate low flows at ungaged sites (Martin & Cunnane - 1976, Lundquist & Krokli - 1985 , Gustard et al. -1992, Demuth -1994, Lena M. Tallaksen and Henny A.J. Van Lanen - 2003 etc). At the same time, the regional studies provide an useful techniques for the assessment of spatial variability of low flows.

The available freshwater resource is often represented in terms of the long-term average annual runoff and expressed as a uniform depth in units of milimeters over the area concerned. This statistic, though providing a measure of the average availability of the resource, gives no indication of seasonal variability of the water available under extreme dry conditions. An alternative to the runoff is the Q_{90}, a flow statistic representing the daily flow which is exceeded or equaled 90 percent of the time. Expressed in milimeters or as a percentage of the mean flow, the Q_{90} can be used by planners and engineers to determine the resource available in periods of low flow or drought.

Using the time series of river flows and a computer program it was possible to calculate the Q_{90} for 42 catchments of Albania. The surface of the catchments varie between 50 and 400 km².

A multivariate regression models will be established to derive estimates of Q_{90} for the ungaged sites. The regression provide a relationship between Q_{90} in l/s, the surface of the catchment AREA, the average annual rainfall AAR and an index of the geology GEO expressed as the percentage of the rocs with high permeability in the classical form:

$$Q_{90} = a * AREA_b AAR_c GEO_d$$

Using this equation the values of will be estimated in 30 ungaged sites. A maping of Q_{90}/Q_{mean} will be established and using this parameter as an indicator of low flow, a regionalisation of the Albanian territory will be established.

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376 - DETERMINING YIELD OF BOLJE SESTRE SPRING (MONTENEGRO) USING THE SALT DILUTION METHOD

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Discharge calculation by salt dilution method (Moor, 2004a) for surface and groundwater, is usually used on the inaccessible terrain where we can-t use classic method (velocity-size of cross section). Salt dilution method was used for calculation of discharge of karst spring Bolje Sestre. Location of Insertion point of the tracer (NaCl solution) was borehole B-8 located about 30 m upstream of the spring. Electrical conductivity measured on the two points on the spring during the salt wave passage. Using four sets of independent data we obtained diagrams of Ec - t correlation, and obtained approximately the same results for all sets (Q = 2,82 m^3/s). Application of this method proved successful and we think that it will find application during research of fast superficial and groundwater streams on the territory of Montenegro.

Keywords: salt dilution method, discharge, karst spring Bolje Sestre

TOPIC 3

FLOODS AND DROUGHTS

010 - SEVERITY AREA FREQUENCY CURVES OF DROUGHT AND WET PERIODS

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Occurrence of extreme climatological events such droughts and wet periods an cause substantial damage to the eco-system. Although such events are regional in nature. They are measured at point scale. As such, it is required to study the spatial distribution of extreme events. Severity - Area- Frequency (SAF) curves are one of the tools to characterize regional scales. A number of methods exit to drive the SAF curves. We used a medium range time series based on SPI drought/wet index to study SAF in Razavi & Southern Khorasan provinces in Iran.

Also, maps of probability of drought/wet occurrence were derived. The results indicated that drought/wet periods occur locally in higher frequencies while only sever low frequency droughts may spread over the whole region. The area is found more susceptible to drought compared with wet periods.

Keywords: SPI, Severity- Area- Frequency, Drought, Wet, Iran.

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015 - INTERPRETATION OF NEW TRENDS IN FLOOD FREQUENCY ANALYSIS: A CASE STUDY

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Conventional flood frequency analyses are based on use of a suitable uni-variate probability density function for the maximum annual discharges. This approach is not robust enough since it deals only with the statistical distribution of annual series. However, flood events are better characterized by the peak discharge, volume of runoff, and the duration of the flood jointly. That is why there is a growing trend in the formulation of multi-variate flood frequency analyses. A bi-

variate flood frequency analysis is performed in which the annual maximum peak discharges and the corresponding surface runoff volumes of a flood are handled as random variables. The results of both approaches, i.e. uni-variate and multi-variate cases show differences.

Therefore, choice of a method for such a study would influence the design and operation of hydraulic structures for high flows. In this paper, a case study has been performed for a basin in Turkey to account for the effect of the differences in the application of the aforementioned approaches. Various bi-variate probability density functions have been applied and tested for goodness. Use of these analyses and suitability of these functions in characterizing the nature of flood events are discussed. The results of a bi-variate analysis are also compared with the findings of the uni-variate analysis carried out using a number of probability density functions. Furthermore, an example is presented to illustrate the effect of the approach used in the flood frequency analysis on the dimensions of a hydraulic structure located in the basin.

Keywords: Flood Frequency, Bi-variate Analysis, Peak Discharge, Surface Runoff Volume

018 - DROUGHTS MANAGEMENT IN SPANISH RIVER BASINS

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In this paper it will explain special actions taken in:

i) Geographic zoning of the river basin, essentially along the lines of Water Usage Systems, a traditional device that has been maintained in present water management legislation.

ii) A system of hydrological indicators for characterizing drought severity, defined in four phases which are, in increasing order of severity: normality, pre-warning, alert and emergency.

iii) The basic indicators are: reservoir levels, piezometric readings - which take account of aquifer reserves -, runoff data in certain parts of the system and rain gauge readings, as well as indicators of water quality or environmental effects.

iv) The above indicators have been grouped into different categories: by their purpose (warning, effect and efficiency indicators), type of PES

measurements involved (forecasting, operating and organizational and management indicators) and by the availability of information (initial and potential indicators).

v) Following a similar procedure in all basins, all the drought indicators were converted into dimensionless values ranging from 0 to 1 (status index). One task - based on the analysis of historic droughts and hydrological simulation techniques - that proved to be highly complex was the definition of the "threshold values" of the indicators used to characterize drought and measure its severity. See figure below as example.

Under these criteria, in this paper it will explain special actions taken in measures characterized as:

- Essentially management measures, not generally calling for works or infrastructures.
- With the exception of forecasting measures (monitoring of alert indicators and maintenance of strategic reserves), all the others are temporary measures to be adopted when drought occurs and after it subsides.
- Mitigation measures are applied progressively, establishing thresholds for application or intensification of measures as the drought grows more severe.

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023 - A LONG-TERM FORECASTING OF SPRING CATASTROPHIC FLOODS IN NORTHEN ASIA CAUSED BY AIR SUDDEN WARMING

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Global warming leads to increasing of water temperature in Northern Atlantic, which in turn causes a rapid degrading of the ice extent in Eastern Arctic. Most dramatic reduction of ice sheet was observed in Kara, Laptev and East-Siberian Seas during late summer and early autumn. These changes provided a more intensive energy exchange between air and sea surface while sea surface temperature demonstrated a positive trend.

Appearance of new phenomenon - the atmospheric convection over ice-free sea surface led to development of low atmospheric pressure anomaly area, which spread over most part of Northern Siberia in Septembers since the beginning

of current century. It is only one part of Arctic Dipole phenomenon related to appearance of two atmospheric pressure field extreme value domains of opposite signs in Eastern and in Western Artic.

Wave theory explains appearance of high atmospheric pressure domain over the same area of Northern Siberia in late winter as a reaction to atmospheric pressure disturbance occurred in late summer. Extremes in anomalies of atmospheric pressure field, which spread over large territory, prevents a normal zonal atmospheric flow across Siberia from west to east and can cause a flow of opposite direction in Eastern Siberia. Inflow of warm and humid air masses from Pacific Ocean and South-East Asia is a main reason of sudden spring air warming in Eastern Siberia. It is interesting to note that in contrast to above the winter positive pressure anomaly causes a rapid cooling in Eastern Europe and in Western Siberia. Thus, suggested approach permits us to develop a physical background for a long-term forecasting model of potentially dangerous weather situations, which might be precedent to catastrophic floods at Siberian rivers. Major input data (ice extent, sea surface temperature, atmospheric pressure and wind fields in tropical, middle and high latitudes) are inferred from satellite remote sensing data.

Evolving of atmospheric circulation patterns in period of March-May 2001 (development of catastrophic flood at river Lena) is considered in details to validate above theoretical background. It was found linkages between the cold front appearance in Northern Pacific and El Nino extreme events in 1998/99. This talk will be illustrated by many examples of dangerous sea surface and weather field evolving and by samples of the seasonal forecasting based on the fuzzy-neural model in cases when atmospheric circulation regimes were in transition phases.

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035 - FLOOD MANAGEMENT SCENARIOS BASED ON HYDRODYNAMIC MODELING

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This paper describes the scenarios developed to assist in the understanding of possible future situations of the complex river system as a part of knowledge

acquisition process. Due to complexity of river system, knowledge acquisition is a major bottleneck to develop an expert system for forecasting flood. Operation of flood control gates has a very important role in flood alleviation. With what-if scenarios development including positions of flood control gates and slackers, the hydrologic behavior of the river system is assessed based on simulated water level and discharge hydrographs at the flood forecast points of interest.

A case study was carried out based on the position of the existing gates and slackers by using Anglian Flow Forecasting modeling System (AFFMS) in the Welland and Glen catchment, UK. AFFMS was developed by DHI based on Mike 11 Hydrodynamic model. Under Mike11 model runs, water levels and flows at the flood forecast points of interest were simulated based on three scenarios of fully open, half open, and fully closed for gates and slackers' position. To evaluate the model performance and arrive at decisions that reduce flood damage, two criteria were employed to analyse the simulation results: percent difference between peak observed value and peak simulated value, and difference between times of observed and simulated peaks in hour.

Keywords: Flood Management, Mike11 model, Flood Control Gate, What-if Scenario, Welland and Glen Catchment.

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048 - MODELLING OF SHORT DURATION RAINFALL (SDR) INTENSITY EQUATIONS FOR ANKARA, TURKEY

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The aim of this study is to develop a rainfall intensity-duration-frequency (IDF) equation for the rainfall in Ankara city of Turkey. The records of the observed maximum annual rainfall values were statistically analyzed for rainfall durations of 5, 10, 15, 30, and 60 min during the period 1940¨C2004. The maxima have been fitted to the Generalized Extreme Values (GEV), Gumbel distributions, and ¦Ö2 goodness-of-fit tests were used to choose the best statistical distribution among them. The parameters of the IDF equations and coefficient of correlation for different return periods (2, 5, 10, 25, 50, 100 and 500 years) are calculated by using a nonlinear estimation method. The IDF equations for T <10 years and for T -Ý10 years were chosen, because they possessed the largest correlation coefficients.

Keywords: Statistical distribution function, Rainfall intensity - duration "C frequency" equations, Flood.

068 - DROUGHT CONSEQUENCE ON CORN PRODUCTION AND EFFECT OF IRRIGATION

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The lowlands in the Vojvodina province, northern part of Serbia, in which crop production is concentrated, have changeable, unstable and unforeseeable rainfalls and dry periods between June and August. Depending on drought intensity, corn yields may be reduced to 50% in relation to the corn production in irrigation. In extremely dry years, yield reductions on corn reach to 80% in comparison with yields obtained in irrigation.

Drought consequences and effect of irrigation on corn production are observed at the experimental site, which is located on the field of Agriciltural Corporation Belgrade (Poljoprivredni kombinat Beograd -PKB) in the southeastern part of Srem, in the riparian area of the river Sava, during the period 2000-2007.

Climatic parameters, which are used for drought intensity and irrigation interval defining, were measured with automatic weather station. Total rainfall in vegetation period (April-September) was in the range from 200 mm (year 2000) to 650 mm (year 2001). Temperature maximum and the number of tropical days (temperature over 30-C) significantly differed through years, nevertheless the highest temperatures and the longest warm period were during the year 2007, when the severe drought existed.

The representative soil type of the experimental site is humoglay, with more than 40% clay, average fertility and unfavorable physical and soil moisture characteristics.

The sprinkler irrigation system covers the area of 600 ha. Corn is grown on around 20% of total area. The water for irrigation, which is of average quality, is used from the main drainage canal. The irrigation interval is determined by the soil water balance, which is computed using a model that is based on FAO 56 IDP.

All through the research period, the drought was significant during years 2000, 2002, 2003 and 2007, with different intensity and in different parts of vegetation

period. Total rainfall in vegetation period amounted around 50% or less, regarding to water requirements of corn. Hence, for the reason of satisfaction of corn needs, the irrigation was applied in the amounts of 80 do 160 mm, depending on drought intensity.

Maximum number of days, when the corn was in water stress varies from 85 days in year 2007 to 63 days in year 2000, when the largest amounts of water were distributed through irrigation.

The annual yield of corn that was grown without use of irrigation amounted from 3.42 to 6.21 t/ha. With the addition of irrigation the yield is increased from 20 to 40% in comparison to one obtained in conditions without irrigation.

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075 - ESTIMATION OF WATER CONTENT OF THE RIVERS OF DANUBE BASIN (WITHIN THE LIMITS OF UKRAINE)

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The territory of the basin of the Tisza, Prut and Siret (within the limits of Ukraine is the Danube basin) treats to one of most flood danger regions of Europe. Floods differs here frequency, intensity of development and simultaneous distribution on considerable territory. Also substantially this region differs from other territories of Ukraine behind the regime of humidity and belongs to most water-wet.

In Carpathians passes from 3-5 (on the average for a year) to 8-15 floods (in wet years), sometimes after each other.

In the basin of the Tisza, Prut and Siret there are frequent floods both in cold and in a warm period of year which substantially influences on water content. That is why for the estimation of water content characterization of runoff of water - depth of runoff was select, and also the followings elements of river runoff and spatial division are certain:

- middle long-term runoff of water;
- annual runoff of water of different probability of exceeding (by frequency of p=1, 2, 5, 10 %);
- runoff of water during the floods of different probability of exceeding (by frequency of p=1, 2, 5, 10 %).

For research the bank of the dates of average annuals of water discharges was made and during floods for period from the beginning of researches to 2003 years (on the average 50-60 years) for to 26 hydrological water posts in the Tisza basin and 11 - in the basin of Prut and Siret.

The cards of division of average annuals of depth of runoff are built according to information received, and also depths annual and flood runoff of water 1 % exceeding probabilities.

The division of runoff for territories of Carpathians in general repeats the division of precipitation. Most middle annual depths of runoff are observed in the Teresva river basin - > 1000 mm, where and catchments with a high runoff occupy greater areas. In western part and on extreme east of the Tisza basin the runoff diminishes as a result of diminishing of humidity of this territory.

Basin of Prut and Siret, where less precipitation fall out, than in the Tisza basin, have a lower river runoff accordingly (to 800 mm).

Transitional coefficients were also certain from the depths of annual and flood flow to other frequencis (2, 5, 10 %).

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076 - WEED CONTROL - A METHOD FOR DIMINUTION THE NEGATIVE EFFECT OF DROUGHT ON SOYBEAN GROWTH

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Some investigations on competition between Soybean and Amaranth depending on climatic conditions during five years field experiment were done. The length and density of infestation were included as factors. The trial was carried out after the perpendicular method in four replications with plot size of 10 m² without irrigation on Vertic Luvisol, WRBSR,2002. Soybean was grown in two field crop rotation - wheat - soybean at equal levels of N fertilization. Observations on Soybean and Amaranth biomass, precipitation and relative humidity during the growing period of Soybean were implemented. The amount and distribution of precipitation during the first two years of observation can define them as very favorable for crop growth. The second two years can be assessed as unfavorable (insufficient precipitation, irregularly distributed during growing period) and the last year holds an intermediate position. The amount and distribution of precipitation exerted different influence on biomass accumulation of Soybean, depending on density and length of infestation. During the most favorable year

for crop growth, Soybean accumulated the highest biomass. The intense biomass accumulation till stage "third triple leaf" restrained Amaranth growth. As a result, the Amaranth biomass varied from 5% of Soybean biomass (at infestation from "emergence" till "third triple leaf" and 5 amar./m²) to 24% (in the variants with 15 amar./m² and infestation from "emergence" to "milky ripeness"). In the same year the precipitation during "flowering" and milky ripeness" increased Soybean competitiveness . As a result, the chare of Amaranth biomass in the total biomass of population is lowest. Conversely, in the most unfavorable year Amaranth biomass dominated at infestation even till "third triple leaf" and "flowering" and varied from 55 to 77%. During the last two stages Soybean biomass became dominate, but nevertheless it was the lowest for the five years experiment. Infestation of Soybean with Amaranth exerted high negative effect on crop biomass accumulation at low amount of precipitation, irregularly distributed. The Soybean yield varied depending on this factor and It was in negative correlation with Amaranth biomass. As the weeds utilize water for biomass accumulation twice as much effective in comparison with Soybean, weed control in dry years is absolutely obligatory.

Keywords: Soybean, Amaranth, density of infestation, length of infestation, precipitation, biomass; drought

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088 - FLOOD ESTIMATIONS TAKING INTO ACCOUNT OF HISTORICAL MAXIMUMS

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Historical maximums are very useful additional information for the estimation of design floods. These maximums can be inside of instrumental measurements, outside of them and as well inside and outside of the instrumental records. In any case, historical maximums allow to specify design floods and sometimes to pass from an extrapolation of empirical distribution of maximum discharges or water levels to an interpolation as more reliable decision. The general theory has been developed for an assessment of empirical probability and parameters of distribution functions (mean, variance, skewness, etc) taking into account any number of historical maximums inside or outside of observation records as well as for mixed case (inside and outside).

This theory has been adapted for different methods of assessment of distribution function's parameters: methods of moments and method of likelihood. The

general formula has been obtained for assessment of any parameter of distribution function. Application of historical maximums' theory has been given for some case study and for assessment of design floods for probability 0.01%, 0.1% and 1%.

In the first example record of annual maximum discharges on the Sulak River - site Miatly has been from 1925 and the historical maximum took place in 1875. Parameters and design floods have been obtained taking into account of historical maximum and without it. Differences between design floods mount to 25-30%. The second example deals with one historical flood in 1886 outside of instrumental record for the Zeya River - site Zejskie Vorota (the Far East of Russia). In the third example for the River Viluy - site Chernishevsky one historical maximum observed in 1992 (QN=16200 m3/s) and one more historical maximum was outside of observation time series in 1890 (QN-1=14000 m^3/s). The last example deals with the catastrophic flood in Lensk city (the Lena River, Eastern Siberia, Russia). Main discussion took place about a re-computation of design water level with return period in 100 years.

Using observed data, catastrophic flood 2001, extraordinary historical level 1878 (outside of instrumental record) and new method of stochastic simulation of composition of inhomogeneous water levels, the re-computed design mark should be higher on 1,3-1,7 m than the existing one.

Additional theoretical and practical problem, which connects with historical maximums, is a suitable analytic fitting of empirical distribution with extreme points. Curvature of many analytic distribution functions (Pearson III, lognormal, etc.) is not enough for an approximation, therefore an exponential function has been suggested in co-ordinates of rank maximum discharges and standard normal distribution (double exponent for observed data). This tool gives a suitable fitting for an upper part of empirical distribution curve with historical maximums.

Keywords: historical maximum, floods, design hydrological characteristic, distribution function

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099 - TESTING OF DIFFERENT METEOROLOGICAL MODELS FOR FLOOD FORECASTING IN FILYOS BASIN, TURKEY

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In this study, Mike11 hydrological model coupled with two different Numerical Weather Prediction Models is calibrated and validated to simulate the runoff from

rainfall in a semi-distributed manner. The model is applied to Filyos Basin in Turkey to simulate the rainfall/snowmelt runoff for the period in between the years 1998 and 2005. The area is highly prone to flooding and because of including several settlement areas and agricultural lands. Effective modeling of the rainfall runoff is needed for the forecasting peak discharge in terms of timing and amount for taking any precautions so that the system can be used as a tool for the Decision Support System.

The river is composed of two big rivers which are connected and forms the Filyos river before discharging to Black Sea. The basin is divided into several sub-basins where each sub-basin is represented by its own characteristics. The model is calibrated and verified with several events. Then the hydrological model is tested with two different NWP Models which are MM5 (Mesoscale Modeling 5) and ECMWF (European Center for Medium-Range Weather Forecasts). It was seen that the accuracy of the model changes due to the uncertainty from the meteorological models.

In some events, the MM5 and ECMWF model gives too different results for some sub-basins. It was also observed that the accuracy of the models changes due to the meteorological system formation as expected. The application of a risk management is presented by showing the advantages and disadvantages of using two different meteorological models.

Keywords: Mike11, MM5, ECMWF, Rainfall-Runoff, Filyos basin, Hydrological, Meteorological model

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120 - AUTOMATED ESTIMATION AND ANALYSES OF METEOROLOGICAL DROUGHT CHARACTERISTICS FROM MONTHLY RAINFALL DATA OVER IRAN

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Drought monitoring is an essential component of drought risk management. It is normally performed using various drought indices that are effectively continuous

functions of rainfall and other hydro-meteorological variables. The paper describes a method for automated estimation, display and analyses of various drought indices - continuous functions of precipitation that allow quantitative assessment of meteorological drought events to be made over Iran. In this paper up to five different drought indices to be estimated over Iran by using Spatial and Time Series Information Modelling Software. They include the Decile Index (DI), the Effective Drought Index (EDI), the Standardized Precipitation Index (SPI) and deviations from the long-term mean and median value. Each index can be estimated from point and spatially averaged rainfall data and a number of options are provided for months' selection and the type of the analysis, including a running mean, single value or multiple annual values.

Keywords: Drought indices, Drought monitoring, Iran.

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143 - THE EXTREME DROUGHT ON SOUTH PART OF CROATIA IN SUMMER 2007

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The extreme dryness was recorded in Dalmatia, the south part of the Adriatic coast of Croatia in June, July and August 2007. The amount of precipitation in Dubrovnik was only 9% (14 mm) of the climatological (1961-1990) average.

The analysis of general atmospheric circulation was shown the persistent anomaly in mean circulation pattern on mean 500 mb geopotential height over Atlantic and Europe. In such circumstances the extraordinary weather event appear on the synoptic scale. The result was that radiate synoptic weather types with lack of precipitation were more frequent then usually in Dalmatia at summer 2007. Because of that unfavorable impact causing among other natural hazards catastrophic forest fires on south Adriatic.

150 - TORRENTIAL PRECIPITATION EVENTS IN BULGARIA: A COMPARATIVE ANALYSIS FOR EAST BULGARIA

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Global warming is suggested to be linked to the recent increase of heavy rainfall events due to the increased atmospheric water vapor and warmer air. Annual precipitation totals also show upward trends in many regions of the world. In most areas of the world, the trends in rainfall have the same sign as the trends of 1-day heavy rain amounts. Contrary to many mid- to upper latitude regions in which the positive trends in precipitation amounts were reported, the investigations of some authors show that in Bulgaria the measured precipitation totals generally decreases especially during the last decades in spite of the fact that in the same period the extreme daily rainfall increase is observed.

A comparative analysis of some very extreme precipitation events was carried out using all the available data for torrential precipitation (totals over 100 mm/24 h in one station are considered) from the meteorological network of the National Institute of Meteorology and Hydrology (NIMH) for the period 1950 - 2006. An increase of mean annual number of days with torrential precipitation with about 20% was obtained for the period 1991 - 2006 versus those for 1950 - 1990. Besides, during the last decade, the flood rain events have occurred frequently especially in East Bulgaria, where a growth with about 57% of the registered number of extreme precipitation days is observed.

The 4 rare cases of extreme rainfall, which caused local floods, are analyzed using synoptic, satellite and radar data.

Keywords: torrential precipitation, floods, synoptic analysis

172 - ORIGIN REASONS OF THE MUD-STREAM OF THE UKRAINIAN CARPATHIANS AND ACTIONS FOR THEIR PREVENTION

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Forming and passing mud-streams is one of most dangerous hydrological phenomena in mountain districts. The personal touch of the rivers regime of region (river of Tisza, Dnister basins and Prut) of the Carpathians are frequent floods of rains and snow-rains, which quite often are accompanied the phenomena of mud flows. In separate districts the destructive action of water element increases because of that.

Forming and passing mud streams at mountain regions is marked by the suddenness of origin, transience and considerable destructive force with extraordinarily high maintenance of hard materials. They are systematically observed in Ukrainian Carpathians and inflict large harm a national economy, especially forest, rural, railway and motor transport, hydrotechnical buildings, economic buildings and dwelling-houses. Thus, in the last years mud-streams took catastrophic character, that it is related not only to the natural terms of mud-streams formations but also, largely, with the lacks of menage at mountain districts. This factor and felling of large areas of the forest and almost complete absence of the special protecting buildings.

From data of long-term expeditionary inspections and stationary supervisions of the Ukrainian Research Hydrometeorological Institute and hydrographical party of the Central geophysical observatory (from data on 2005), it is counted up in the estimations of intervals of morfometrik description of mud basin and hydrographical descriptions of mud-streams, and also the types of mud flows, which prevail in this or other basin, reason of their education and area of origin, are selected.

In Tisza basin separated 193 muds basins, Dnister - 85, Prut - 125 and Siret 18.

It was analysed methodical base of probabilistic forecasting of the muds phenomena in the basin of Tisza, Dnister, Prut and Siret rivers, which is developed in the Ukrainian Research Hydrometeorological Institute. For the improvement of its functioning and comfort of using it in operative forecasting consider, that it is needed to take into account the following:

- for more exact forecast of the muds phenomena in this or other particular basin with a selection intensity of their display for particular areas need

timely receipt in the real time of information about precipitations, and also forecasting of precipitations on 6-12 hours beforehand with pointing of their amount;

- it is necessary for the exposure of probability of display of mud floods, that parallel with forecasting there was a constantly renewable bank of data about time of passing mud flows in this or other particular basin or particular area. It enables to analyse the presence of fragmental material on the area of catchment and define power of mud demonstrations;
- it would be fine, if the results of forecasting were given out on cards or using GIS-technologies. It will be more model presentation, than forecast as text message. And also, probabilistic forecasting of the muds phenomena must be carried out in one system together with the forecasts of floods, because passing powerful floods are always accompanied the muds phenomena.

182 - FLOOD AND DROUGHTS: THE INDIAN SCENARIO

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Floods and droughts form the two extremes of then hydrological cycle. Hardly a year passes for India when some part or the other in the country does not suffer from one of these extremes, sometimes during the same year. A bout 40 million hectares of land is prone to floods, which appears to be rising every year while 70 per cent of the total area of India is drought-prone and 12 per cent of its population is subject to this extreme event annually. The nature and intensity of flood problem varies from one river system to another, being very acute and complex in the northern river basins, formidable in the central river basins and sometimes menacing in the southern river basins as it happened in 2005 and again in 2007. Though a National flood control programme was launched as far back as in 1954, yet from 19 million hectares in 1953, the flood-prone area has risen to 41 million hectares snce then and is most likely to go up to 60 million hectares when one sees the consequences of floods in the last five years, notwithstanding the many river projects that were undertaken to control floods. A study of the occurrence of floods and droughts in INDIA reveals interesting inferences . Between 1891 and 1979, there were 15 droughts with an interval ranging from 1 to 20 years gap, while there were floods at intervals of 0 to 21 years. It is needless to point out that this frequency is on the higher side in case of both these extreme events, a comment on the inefficacy of the measures

taken to control them or reduce their effect. There is yet no method developed to forecast droughts , except study of rainfall during the previous years and drawing inferences from the monsoon behavior with the help of remote sensing methods in which field India has acquired expertise and competence by launching weather satellites while a model flood plain zoning was prepared and circulated to State governments. A country-wide flood forecasting system and warning systems have been established by the Central Water Commission to cover most of the flood-prone inter-state rivers. There are 157 flood forecasting stations in all, with 109 of them located in the Ganga -Brahmaputra-Meghna system alone, 15 for west-flowing rivers, 8 for the Krishna, 3 for the Mahanadi, 9 for eastern rivers and 13 for the Godavari. A National perspective plan is in progress by which rivers of the north are proposed to be linked to those of the south, one of the aims being to control floods and let waters reach the drought-prone areas.

184 - FLOODS IN AGRICULTURAL AREAS ALONG MESTA RIVER

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Natural hazards and flood events are part of nature. In most cases, floods are caused by climatological phenomena, which are out of human control.

Two natural disasters such as drought and flood have effected on different parts of the earth as a result of increasing human's interference on global climate. As a consequence of the climate change the probability of the occurrence of flood events have increased. In the recent years, our country was alternatively witness in occurring of floods and severe droughts in many of places. On the other hand, occurring of severe floods has caused destruction of agricultural lands.

The process of the delimitation of the endangered agricultural areas is a priority task for Bulgarian scientists and of the Water authorities. A research of the river basin of Mesta concerning such flood issues has been carried out. Hydrological analyses are made in order to get the probability of the maximum runoff. The obtained results will be considered in different variants for flood events (water level or depth, flood extends), meeting the requirements of the EU Flood Risk Management Directive.

The watershed of Mesta River needs an alternative and correct management reducing the effects and damages of flood. For succession in these actions, an alternative and optimum flood risk management in that watershed is necessary. This research is expansible and usable for the other similar river basin.

Keywords: maximum runoff, flood, hydrology, Flood Risk Management Directive

194 - PROBALISTIC DEFINITION OF FLOOD WAVE GENESIS IN A PORTION OF A RIVER BASIN

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The paper examines flood wave genesis in a portion of a river basin under conditions which involve considerable spatial and temporal variation of river flow. A procedure is presented for the definition of hydrograph components for the considered portion of the river basin for different probabilities of occurrence. High-flow coincidence functions are established for the defined hydrograph components. A procedure for the creation of a potential flood wave genesis pattern to the point of output from of the considered portion of the river basin, for different flood scenarios, is presented at the end of the paper.

The paper illustrates a practical example of the definition of flood wave genesis in a portion of the Pe-tan River Basin in Serbia.

Keywords: flood wave genesis; spatial and temporal variation of river flow; hydrograph components; coinciding high flows; flood wave.

198 - HYDROMETEOROLOGICAL RISK PHENOMENA IN THE ALBA IULIA – TURDA DEPRESSION. ROMANIA

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In order to assess the vulnerability of communities to the unleashing of extreme hydrometeorological phenomena, observations on their onset and development should aim at quantifying intensity and frequency, also establishing and foreseeing possible damage. The present study focuses on a few atmospheric phenomena registered in the Alba Iulia - Turda Depression over the 2002-2006 interval, given that the damage incurred involved aspects of risk.

Dangerous atmospheric phenomena, heavy rainfall in the main, led to other natural risks affecting both the environment and the socio-economic activity. Apart from atmospheric causes, the risk for other natural events are related to local particularities, e.g. lithological structure (sandy-clay substrate), landform (slopes and highly fragmented relief) and soils (little forestland and grassland due to human pressure - dominantly arable land and numerous human settlements). Houses and annexes as well as socio-economic constructions were damaged, lots of animals and poultry were perished, national, county, communal and forester's roads, bridges and foot-bridges were washed away or disaffected, crops were flooded, trees were brought to the ground, electrical and telephone networks were destroyed. Heavily affected were the road infrastructure, the hydroelectrical constructions the socio-economic units, the electrical and telephone networks and agriculture generally.

The number of catastrophic situations, unusually high in 2005, represented 44% of all the interventions made over the past ten years to limit and remove flood effects. Negative hydrometeorological phenomena were found to occur mainly in summer, especially in June and July when torrential rains and floods are common. Significant damage is recorded also in spring (March, April), when snowmelt coupled with rich precipitation may trigger extensive flooding. Analyzing the above situations we could say that most flood events were registered in small drainage basins and in torrential bassinettes.

Limiting the negative effects calls for the afforestation of slopes in the affected drainage basins, the construction of dams, the execution of works to consolidate or even change the direction of the roads running close to some watercourses.

Keywords: hydrometeorological risk phenomena, risk management, Alba Iulia - Turda Depression, Romania.

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202 - CHARACTERISTICS OF THE SUMMER DROUGHT 2007 IN ROMANIA

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Characteristics of the summer drought 2007 in Romania. Romanian's temperate - continental climate has four seasons with two extremes warm, sometimes hot, torrid summers and cold, sometimes frosty winters. Transitional seasons are

spring and autumn, bearing some traits of the two extreme seasons.

Global warming has enhanced the general atmospheric circulation creating unspecific weather and climate aspects both worldwide and in Romania. As a result, there are great climatic variations in the seasonal evolution.

The summer of 2007 is relevant in this respect, with June and July averages having deviations of 17°-20°C against the multiannual mean, due to the almost continuous persistence of tropical heat waves. So, these two months proved to be the warmest ones within the last seven decades. The heat peak was on June 26, 2007 and July 15-24, 2007, with a record high over 42°C and 44.3°C, respectively for these months in Romania.

The heat interval staying in continuously destroyed nearly 60% of the stalky cereal crops of hoeing crops, wells got dry, having a severe negative effect on the economy and the population's health.

Keywords: heat phenomena, summer, Romania.

218 - APPLICATION OF SPATIAL TECHNOLOGY FOR THE PREPARATION OF PRIMARY FLOOD RISK MANAGEMENT GUIDELINES IN SRI LANKA

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Flood is one of the common natural hazards that is experiencing in Sri Lanka. This has been creating a numerous types of environmental as well as socioeconomic issues in the country. Environmental pollution, damage and degradation of valuable properties, lost of lives, many people lost their shelters, etc. are some of the issues created by floods. In Sri Lanka, floods are more significant in central highlands and coastal lowlands of Southern, Southwest and Eastern provinces. However, in few occasions in the past there were sever floods had recorded few other regions as well. According to the historical flood data in country, many floods were recorded during Southwest and Northeast monsoon periods form May to August and December to January respectively. Sri Lanka get an intense rainfall during these periods and it acts as the key factor which influences to create several floods in each year. According to the geomorphological and the landscape settings of Sri Lanka, many rivers start from the central highlands

and flow towards the coastal lowlands and fall into the sea in different places. During heavy rainy seasons, extremely high discharge can be observed in some of these major rivers like Mahaweli, Kalu, Kalani, Walawe and Gin rivers and their tributaries. This has influence to create river floods in many occasions in several places closer to these rivers. Also when these rivers transport high amount of water to coastal lowlands, coastal floods experience in many places mentioned in the above districts. However, flash urban floods are not very common in Sri Lanka when compared to river floods and coastal floods. Modification of floods plains due to siltation, soil erosion and deforestation for the chena cultivation, alteration of geomorphology by natural and human activities, climatic changes and experiencing heavy rainfall, .. etc are the main reasons to record many number of floods within last ten to twenty years in Sri Lanka. With the increase of recording no of floods in the country, the government has been paying more attention to introduce a proper flood risk management guidelines. However, this is not an easy task as the behaviour and the complex nature of factors which control floods. This research attempts to initialize primary guidelines for flood risk management in Sri Lanka. As an initial step to introduce flood risk management guidelines, thematic maps were produced using satellite imageries and available flood data which are directly related to control floods. Then spatial technologies i.e. Geographic Information Systems and Remote Sensing were used to analyze these thematic maps and to produce flood risk zoneation maps. Thereafter, these flood risk maps were used as index maps to introduce primary guidelines for flood risk management. However, these are primary guidelines and are to be modified with the change of conditions of the factors control floods to prepare better guidelines which can be implemented to minimize the flood risks in Sri Lanka in future.

Keywords: Flood, Risk, Geographic Information Systems.

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219 - EFFECT OF TSUNAMI ON THE COASTAL ENVIRONMENTAL IMPACTS OF SRI LANKA

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Sri Lankan coastal zone is defined in the Coast Conservation Department Act No : 57 of 1981 which is having high demographic pressure when compared

to other regions of the country. Therefore, many environmental as well as social problems have been experiencing from the past. Change in natural environmental conditions and climatic changes as well as human activities are responsible for creating such problems. The tsunami which had happened on 26 th December, 2004 was the most serious environmental hazard that Sri Lanka ever experienced and was created huge damage for the property as well as lost more than 40,000 human lives. Not only that it was created sever environmental and social problems. Deposits of debris and sand were carried by tsunami was a serious challenge to the solid waste management system. Water contaminated by these debris, water became more saline due to over-pumping of wells and well water got contaminated with chemicals carried from tsunami water were some of the serious issues of drinking water created by the tsunami. Damage for the existing marine, shoreline and inland ecosystems was another bad experience could be observed after the tsunami. Threatened for the existing marine, shoreline and inland ecosystems was another bad experience could be observed after the tsunami specially along the Eastern and Southern coastal zone of Sri Lanka. Coastal erosion, posing an acute risk of water logging and loss of economically valuable lands, increased many diseases, blocked drainage channels, etc are some of the other few environmental and social issues experienced after the tsunami. However, even after one year, no proper solutions are identified to over come some of these environmental issues. This implies that the tsunami was seriously affected by some of the coastal regions of Sri Lanka and created many environmental as well as social impacts and also will take another couple of years to recover from some of these issues.

Keywords: Tsunami, Coastal Zone, Social Issues.

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238 - IMPROVEMENT OF FLOOD MANAGEMENT SYSTEM - MOSES

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The disastrous flood events of the past ten years have caused numerous human casualties and the material damage reached unprecedented levels. Slovakia, Hungary, Germany, Ukraine and Romania, inspired by the successful Dutch/ German flood information project, Noah, were taken the initiative for a concerted action to reduce the effects of floods in their territories.

The main target of the MOSES project is to contribute to the development, implementation and management of a unified computer-based flood information system in the entire region. For Ukraine and Romania there is firstly a need to upgrade their hydrological measurement stations. Slovakia's main interest is to select an information system, which is compatible with the Hungarian FMIS. Hungary focuses on flood hazard mapping and has as lowland the profit of an adequate flood information system in the whole region. The German partner shows interest to implement the FLIWAS flood information system on its territory.

Discussions in 2005 were meant to have an understanding of the needs, wishes and plans in field of flood management of Slovakia, Hungary, Ukraine, Romania and Germany. Concluded was, that the main subject of a common project has to be the implementation of a flood information system that fits these countries and that could also be of interest for other countries in the region.

Parts of the area were damaged by devastating floods in recent years, which created the need for adequate flood protection measures. In all five countries there is a strong commitment to enhance the safety for the inhabitants. However, insufficient cooperation and financial limits prevent a sustainable solution to counter flood hazards.

In Slovakia, Hungary, Ukraine and Romania there is a comparable institutional structure for flood protection: a national institute which is responsible for the technology of flood warning and forecasting and a national authority with regional offices dealing with daily flood management. The Saxon State Agency for Environment and Geology is responsible for the State flood management.

Reduction of flood damages and rising efficiency of flood management by improving decision making and improving tools for co-ordination, both local, regional and transboundary at river basin scale.

Improvement of flood management system

In this project are involved others 7 partners, which have 3 years of experience in this activity Through expected results, by de reduced damages will be beneficial for considered area with enlarged area.

Moses project have multiplier effects for many localities, social and economic activity. Monitoring, forecast, warning, dissemination of hydrological information for the flood management.

The overall, long term objective can be described as follows:

- Reduction of flood damages and rising efficiency of flood management by improving decision making and improving tools for co-ordination, both local, regional and transboundary at river basin scale.

- Focus is on implementation and management, including further development and adjustment to the local situation of a unified GIS-based digital flood information management system in the region capable for managing on line

hydrometeorological and hydrological data by selected forecasting and scenario analysis models.

- Dissemination of reliable flood information on two levels:
  - expert and system info layers for the organisations obliged by law to perform emergency operation and management activities;
  - to the public, professionals and organisations as well as to the media;
  - Improvement of the link between flood forecasting and flood management;
  - Improvement of the quality of hydrological and meteorological data.

Romanian partner, NIHWM will be implicated mainly in the following actions:

- Monitoring, forecast, warning and management flood system.
- Measurement of water level, discharge, hydrological study, diagnosis.

Partners of the project :

National Institute of Hydrology and Water Management NIHWM

Slovak Hydrometeorological Institute Bratislava SHMI

Slovak Water Management Enterprise SWME

National Directorate for Environment, Nature and Water NDENW

VITUKI Environmental Protection and Water Management Institute

Saxon State Agency for Environment and Geology SSAEG

Transcarpathian Administration of Melioration and Water Management

Hydrometeorological Center Uzhorod.

Target group

Waters Directorate Somes - Tisa Cluj Napoca, county professional and public Authority

Final beneficiaries

Localities of Counties Maramures, Satu Mare, Bistrita Nasaud, Baia Mare

and countries Ucraina and Hungary.

Estimated results

The main estimated results of the MOSES project are:

- Operational digital flood information system in Slovakia compatible with already existing flood management and information system (FMIS) in Hungary,

- Operational digital flood information system in Saxony,
- A methodology for GIS-based flood mapping system for Hungary based on DEM (Digital Elevation Model),
- Dissemination of flood information to legal emergency organisations, public, professionals, (international) organisations and the media,
- Improved co-operation between partner organisations in the same transboundary river basin/-Training of personnel, improvement of flood action plans and better preparedness for flood situations.

For Romanian partner will be the improving warning system for the Waters Directorate Somes - Tisa, for local authorities and to improve the bi-lateral agreements deliveries (warning and forecasts) to Hungary. A large benefit for Romania will be the improvement of the Ukraine Hydrological Services forecasting system to provide warnings and forecasting for the upper Tisa, in flooding condition of the Maramures and Satu Mare counties.

Keywords: management, flood, river, damages

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245 - SHORT-TERM FORECASTING OF DROUGHT BY CONJUNCTION OF ARTIFICIAL NEURAL NETWORK AND WAVELET TRANSFORM MODELS (A CASE STUDY OF QAZVIN PROVINCE, IRAN)

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Drought is a disaster and different from other natural disasters. It starts gradually but develops very fast. In addition, forecasting of its start and its end is very difficult and complicated than other natural disasters. Drought forecasting plays an important role in water resources management and drought hazards mitigation. For moving from crises management to risk management of drought, the planning of objectives is difficult because we have not much information or recognition from drought behavior, characteristics, and hazards. Therefore, drought monitoring is one of the key factors in drought management and moving from crises management to risk management, especially in the potential areas to drought risk same as arid to semi-arid regions.

If short-term forecasting of drought to be possible, a huge amounts of drought damages can be reduced and drought management will be more practical and more reliable.

Artificial Neural Network (ANN) has proven its high capability in modeling and forecasting of static non-linear time-series in water resources engineering. On the other hand, Wavelet transform using decomposition of time-series into deterministic and non-deterministic components causes improvement in performance of ANN in forecasting.

The main objective of this research is to find out the capabilities of a conjunctive model based on ANN and Wavelet transform for monthly and 2 and 3 monthly forecasting of drought.

In proposed conjunctive model, firstly the time-series of monthly Effective Drought Index will be converted into sub-components, then these sub-components will be forecasted using the ANN models. For construction of the input pattern of the network, the monthly rainfall and standard precipitation index also are used.

Results obtained from analysis of the synoptic meteorological research station of the Qazvin province indicated that the performance and reliability of the conjunctive models in forecasting of drought are much better than the ANN models. Three monthly forecasting application of the conjunctive model caused the R^2 to be increased from 0.364 (in ANN model) to 0.9676 and RMSE to be reduced from 0.6424 to 0.0328. The research results indicated that the Wavelet theory resulted better and more reliable results in drought forecasting, especially in short-term forecasting of drought than the other methods e.g., ANNs.

Keywords: Drought, Forecasting, Drought index, Artificial neural network, Wavelet transform, Qazvin

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260 - COMPARISON BETWEEN TWO METHODS TO ESTIMATE FLOOD DISCHARGE FOR SMALL BASIN

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S-Frequency and SCS (Soil Conservation Service) methods have been applied in the present study for the estimation of flood discharge from small watershed. The Guvenc watershed is about 16.12 km, is a part of Sakarya watershed, which is situated in Central Anatolia. SCS method involves various types of information related to vegetation, hydrologic soil group and antecedent moisture condition of

watershed. TNT Mips 6.0 software was used for the rectification soil and land use map and also to derive SCS Curve Number (CN) for study area. The SCS model was then applied to estimate the flood discharge for annual maximum value of watershed. Observed hydrological data (runoff and rainfall values) from 1987 to 2005 in the watershed have been also used to calculate flood discharge using by S-Frequency method for various return periods. The results generated both using SCS and S-Frequency methods have been then compared the accuracy of CN for the basin.

Keywords: SCS curve number, S-Frequency, flood discharge, Guvenc

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283 - ANALYSIS OF DROUGHT CONDITIONS IN 2007 IN REPUBLIC OF MACEDONIA

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Last year (2007) was the year of extreme events in the Republic of Macedonia. Numbers of meteorological parameters gave the image of the conditions that happened. This drought was one of the most extreme droughts in the history of meteorological records in our country. We had extremes values in the beginning of winter, in spring and especially in summer with high temperatures, high winds and low humidity without more of 40 days of precipitation in the mean agricultural regions.

Forest and bush fires in large areas could not be easily stopped. Decreasing of agricultural production and water reservoirs as a result of increased water necessity becomes reality which our society has to face and there for it will feel the consequences.

In this paper meteorological conditions (temperature, precipitation, evaporation) are investigated during all the year by frequency, duration, intensity and by multi annual data comparison.

Keywords: drought conditions, precipitation, evaporation

285 - DROUGHT MANAGEMENT PLAN FOR ANKARA

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A drought is a period of drier-than-normal conditions that results in water-related problem. The beginning of a drought is difficult to determine. Several weeks, months, or even years may pass before people know that a drought is occurring. The end of a drought can occur as gradually as it began. Dry period can last for 10 years or more.

The first evidence of drought usually is seen in records of rainfall. Within a short period of time, the amount of moisture in soils can begin to decrease. The effects of a drought on flow in streams and rivers or on water levels in lakes and reservoirs may not be noticed for several weeks or months. Water levels in wells may not reflect a shortage of rainfall for a year or more after a drought begins.

Balancing the needs of all the users of a water supply during a drought can be very difficult. Local or State agencies must take decisions on how water will be used to satisfy the most critical needs and to reduce economic and environmental problems. In times of severe drought, water users must cooperate and share the limited mount of water available to protect the critical needs of people, fish and wildlife, agriculture, and industry.

Conserving water is very important during drought periods. Water saved by one user may be enough to protect the critical needs of others.

Irrigation practices can be changed to use less water or crops that use less water can be planted. Cities and towns can ration water, factories can change manufacturing methods, and individuals can practice water-saving measures to reduce consumption.

Last drought conditions occurred in Ankara obviously showed that it is essential to prepare an effective drought management plan immediately. Most of the studies proved that the population of Ankara is growing rapidly but conversely the water resources are limited and not enough to demand.

In this study, a sample drought management plan is prepared according to the net water in the reservoirs and to demand of people.

Keywords: drought management, drought mitigation, water consumption, water conserve

289 - USING STANDARDIZED PRECIPITATION INDEX FOR MONITORING DROUGHT AND ANALYZING DROUGHT

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Drought is a natural phenomenon that has significant economic, social, and environmental impacts. Drought differs from other natural hazards in the sense that its onset and end is difficult to determine. It develops slowly and its impacts may remain for years even after termination of the event. Impacts of drought are usually first apparent in agriculture, but gradually move to other water-dependent sectors. Recovery time for water stored in surface and subsurface systems can be quite long under severe drought conditions.

The impact of rainfall deficiency on water resources varies markedly on temporal scale for different water storages. While soil moisture responds to precipitation anomalies on a relatively short scale, groundwater, streamflow, and reservoir storage reflect the longer-term precipitation anomalies. Standardized Precipitation Index (SPI) quantifies precipitation deficit for multiple time scales, which reflected the impact of precipitation deficiency on the availability of the different water suppliers. SPI is calculated for 3, 6, 12, 24, and 48-month time scales to reflect the temporal behavior of the impact. The SPI provides a quick and handy approach to drought analysis. Other advantages of this approach are its relative simplicity and minimal data requirements.

Keywords: Standardized Precipitation Index, SPI, drought severity

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294 - THE REPORT BETWEEN WATER RESOURCES AND CONSUMPTION NECESSITIES IN EXTREME CONDITIONS IN A RIVER BASIN OFTEN AFFECTED BY DROUGHT

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The hydrological drought manifests itself by maintaining a deficit of water resources during a relatively long and continual period. The Southern area of Romania in which lies the studied basin - the Ialomita River Basin is often

affected by droughts, as the entire extra-Carpathian space in which the excessive characteristics of the temperate-continental climate strongly manifests.

The study of the way in which drought affects available surface water resources is very necessary in a basin like Ialomita - situated in an intensely urban and industrial area in which drinkable and industrial water sampling reach high values.The high water consumption for irrigations is added to all this on the lower course of the Ialomita River which crosses the Baragan Plain, the most important agricultural area of Romania. Situates in the vicinity of the metropolitan area of the Romanian capital, the Ialomita River also contributes to the satisfaction of water demand of Bucharest, through the derivation of a part of its discharge for the supplementation of water supply of the reservoirs on the Colentina River.

From the point of view of the anthropogenic changes, that is the proportion of discharge tapping for the utilities, the Ialomita River is, together with the Arges River, one of the most affected rivers from the entire hydrographic network of Romania.Taking into account the context of the ideas mentioned above, the evaluation of resource vulnerability offered by the hydrographic network of the Ialomita River basin during hydrological drought periods represents an interesting analysis objective, which also has a certain practical value.

This paper makes a thorough analysis of the runoff regime in the Ialomita River Basin identifying the dry periods and characteristic years from the point of view of minimum runoff. The analysis centers upon the study of the values of minimum runoff at the Slobozia hydrometric station, which is the most representative and has the oldest functioning periods. There are evaluated the available resources from an excessively dry year (2000) and the minimum consumption necessities for the utilities from the Ialomita River Basin until the Slobozia hydrometric station. Based on the resources-consumption report, it is appreciated the vulnerability of water natural resources in current conditions for the insurance of water demands.

Keywords: hydrological drought, water resources, vulnerabilities, anthropogenic changes

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334 - ANALYSIS OF METEOROLOGICAL DROUGHT IN SLOVENIA WITH TWO DROUGHT INDICES

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Meteorological drought is often described in terms of drought indices, which are simple to use and simultaneously absorb great amount of precipitation data,

temperature data, ground water content data, etc. Two of them were used in analysis of meteorological drought in Slovenia: standardized precipitation index -SPI and Palmer drought severity index - PDSI. SPI can be calculated on different time scales, which is better for determining drought onset, duration and intensity. SPI with its multiple time scale can be useful tool to determine the effects of precipitation shortages to ground water level, river discharges and soil water content. The comparison of two indices for location Ljubljana showed good agreement between the PDSI and SPI on nine- and twelve-month time scale. Both indices indicated that after 1900 Ljubljana experienced worst drought conditions in 1947. SPI on three-month time scale showed significant (α=0.05) negative trend for summer precipitation (period 1961-2006) for stations Ljubljana, Murska Sobota and Bilje, located in three different climatic regions within Slovenia. SPI on six-month time scale for September 2003 indicated extreme precipitation deficiency in greater part of Slovenia, except northwest; where above average precipitation was measured. In 2003 Slovenia recorded its most severe drought conditions after 1950 in all agricultural parts.

Keywords: meteorological drought, standardized precipitation index, Palmer drought severity index, precipitation, Slovenia

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345 - CONSTANT AND VARIABLE TRESOLD APPLICATIONS FOR EXTREME EVENTS ANALYSIS

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Damages caused by extreme hydrological events (flood and droughts) need improved methods of analysis for decision support systems development. Some of them are known (theoretically developed) but not widely used in hydrological practice, and some new methods need improvement in practice. In changed conditions caused by local and global changes improved stochastic methods must be used. Two of them (TIPS and RUNS method), theoretically explained by professor V. Yevjevich (1972, 1984), are most suitable for continual data set analyses.

New methodology for derivation of variable threshold based on structural analysis of daily hydrological series time functions using modified TIPS (Tendency-Intermittency-Periodicity-Stochasticity) method is introduced by the authors of this paper and first presented through two contributions at the BALWOIS 2006 Conference. First of cited papes ("Structure of Daily Hydrologic Series in

Serbia and Northern Mediterranean") explains theoretical fundamentals, general estimation procedure and two of possible applications: hydrological regime studies and catchment state behavior analyses (early detection of drought condition appearance or catchments potential for floods). Second paper ("Development of Drought Monitoring for Serbia"), through intercomparison of different constant and variable threshold hydrological drought derivation methods, explains advantages of new techniques based on TIPS approach and deciles plus MA-method for daily variable threshold derivation and (instead of daily total runoff) method which includes daily base flows.

In the present paper, combining TIPS method with method of RUNS, some new applications and case studies are demonstrated: (i) Constant threshold and RUNS method application for classical (dikes based) flood protection system design and existing systems analyses, (ii) Modified variable threshold method applications for polder design and analyses, (iii) Dry and wet period characteristics studies.

Methods are demonstrated using daily discharges series from Serbia and yearly precipitations series from Algeria.

Main purpose of this paper is to show advantages of method of runs applications for flood (and drought) studies, protection system design and management over classical methods (annual maximum series - AMS and partial duration series - PDS, also called peaks over threshold - POT method) where only restricted number of extreme characteristics are included. For that reason we suggested abbreviation MORE (method of runs for extremes analyses).

By developing new macro-programs for MORE applications in VBA 6 (Visual Basic for Applications) which is combined with earlier developed macros for TIPS method, all applications are realized in the EXCEL environment. In that way we obtained attractive tools for sophisticated stochastic models applications in hydrological practice with no need for expensive commercial software.

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363 - CONDITION OF THE GROUNDWATER IN THE REGION OF SKOPJE FIELD

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Hydrology in all catchments is defined like complex of geo-physics and hydro-geologic parameters. The knowledge of the regime of ground water is very

important for the economy, population, water supply and industry.

Hydro technical objects are one of the more artificially factors who influence over the regime of ground water. For example, we have regulated the river bed of the river Vardar which led to a perceptible lowering of the level of ground water especially in the urban territory of the City of Skopje.

The same happened with the ground water in Skopje field after the construction of drainage system in 1964, but because of out of maintaining the system, between December 2002 and February 2003, we had a lot of flooded lend.

Keywords: Droughts, floods, environment, meteorology, hydrology

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373 - CONSTRUCTION OF THE WETLAND AREAS FOR PROTECTION AGAINST FLOODS ON CRISUL NEGRU RIVER

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The Crisul Negru river is placed in western part of Romania and is transboundary river with Hungary. It has now many rezervoirs for protecting against flood so to made some polders to receive the floodings is wery important.

I will present some variantes of constructions which will be in accord with the "Romanian-Hungarian Hydrotechnical Committee".

393 - METHODOLOGY FOR COMPLEX RISK ANALYSIS OF FLOODS IN BULGARIA

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During the last years the interest of society toward natural destructive processes increasing considerably. These processes constitute a giant mechanism of destruction witch cause a huge damage and often take people's lives.

To a considerable extend this is relevant to Bulgaria what is located in active orogenic zone with complex tectonic structure, variegated geological formation and intended relief display the whole spectrum of destructive processes.

The risk management is a modus operandi of the society faced against disaster. Multyrisk is important part of the risk and disaster management processes, which take into account all types of potentially damaging phenomenon.

The recent research is focused on the multirisk analysis. The maim aim is to obtain multy-risk maps of floods and landslides for several selected areas of Bulgaria. The disastrous floods that hit Bulgaria in the 2005 are taken into consideration. Clear identification of the different hazards has been done, their consequences, elements at risk and their vulnerability as well as the analysis of the triggered secondary events investigated.

The final result presents a multirisk profile of the selected areas. The main result of this report is a first attempt to make the multirisk mapping. The study has a pilot character.

The space-time relationships between the natural hazards, vulnerability of the different structures and the consequences analysis seem to be the most important factors about the respective safety measures and the reconstruction works performed. The visual presentation, the schematization, and the structures resistance investigations could improve the risk management process at the affected areas. The results obtained could be useful about the decision makers, risk analysts and safety measures in the future similar situations.

Key Words: multirisk analysis, vulnerability, floods, landslides

TOPIC 4

INTEGRATED WATER RESOURCES MANAGEMENT

005 - IMPACT OF THE WATER ESCAPES ON THE TOTAL LOSSES OF THE DAM OUIZERT

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The phenomenon of the water's escapes on the level of the dams results by considerable into invaluable water and rare losses and also in very serious threats of the stability of the hydraulic works. Moreover, more the share of the stoppings are subjected to a loss of capacity due primarily to three phenomena to knowing: water leakages, the silting of reserves and intense evaporation. In Algeria, we listed approximately fifteen stoppings having losses by escapes which exceed 1 million m^3 per year for each one, among these stoppings six have a volume of escape higher than 5 million m^3 . Due to the non existence of a better site and the establishment of the dam Ouizert in an unfavourable site with the storage of water and favorable to the water leakages, this stopping is strongly prone to this problem and its loss of capacity is in evolution because of the increase in the water leakages. In spite of the grouting curtain which were carried out along the axis of the dam and which allowed the suppression of the right bank water leakages, the problem of the water losses through left bank of the stopping towards the downstream always remains. The dam ouizert is Located at approximately 35 km in the Western - South of the place head of the wilaya of Mascara. It has a total capacity of 100 million m^3 , it is intended to increase the degree of regularization of the Wadi El Hammam for the drinking and industrial water of Oran - Arzew, the irrigation of the perimeter of El Habra located at the North of Mohammadia and to feed the dam Bouhanifia by the lachers. However, this stopping is threatened by the escapes through the left bank in clear evolution in time. The stopping has never reached its maximum level, since the lost volume generally borders the value of $1m^3/s$. We present in this study the assessment of the total water the total losses of the dam Ouizert while trying to show the impact of these escapes on losses on the level of this stopping especially which we considered interannual the volume of the escapes average at 10.42 hm^3. From where we can conclude that the water leakages are the principal cause in the increase in the total losses of the dam Ouizert beside the accelerated silting of reserve and intense evaporation.

Keywords: Total losses, Escapes of Water, Rivets, Dam, Ouizert, Algeria

008 - ADAPTIVE MANAGEMENT IN TRANSBOUNDARY RIVER BASINS: DEVELOPMENT AND APPLICATION OF A FRAMEWORK FOR REGIME ANALYSIS

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4. Institute for Inland Water Management and Waste Water Treatment RIZA, Arcadis, et al. (2003). Netherlands Drought Study: Final report phase 1., P.O. Box 17, 8200 AA Lelystad, The Netherlands
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River basin management is faced with complex problems that are characterized by uncertainty and change. In transboundary river basins, historical, legal and cultural differences add to the complexity. The concept of adaptive management gives several suggestions for handling this complexity. In this paper we elaborate this concept and develop a consistent and comprehensive framework for evaluating transboundary river basin management regimes. The framework consists of specific criteria and indicators concerning actor networks, policy processes, information management and legal and financial aspects. Moreover, we present the results of applying this framework to the international basins of the Amu Darya, Orange and Rhine River. The extent to which the regimes in these basins resemble an ideal adaptive regime differs significantly. We conclude that the framework provides a comprehensive perspective on transboundary water management and can be used to systematically identify which parts of a water management regime are already well developed, and which parts could be developed further.

Keywords: Adaptive water management, transboundary, regime analysis, Rhine, Orange, Amu Darya

021 - THE URGENCY OF LAND RECLAMATION IN THE AGRICULTURAL SECTOR IN NORTHERN CYPRUS

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In Northern Cyprus, agricultural irrigation occupies the great part of the total water extractions from the aquifers. The amount is about 70 % for the agriculture, and the remaining is used in the domestic including the small industrial sector in the country. The water extractions vary between 100 MCM and 140 MCM per year. This amount depends principally on the cultivated area during the year. However, the safe yield of the aquifers in the country is about 74.1 MCM. This over extractions resulted in sea water intrusion to the only underneath water resources in the country since 1960s. This phenomenon caused degradation in the water quality in the aquifers and as a result an important decrease in the crop production. Despite the statistical data revealing that the present degradation and the reduced crop production is not economic, the water extractions still carries on aggravating the seawater intrusion due to misbelieve among farmers. The traditional crops grown in the country nowadays are not suitable for this contaminated water, hence, the new crops must be chosen which is suitable not only for the water quality but also to the soil characteristics and regional climate under land reclamation. Additionally, the water quantity in the regions should be considered and the safe yields should not be either met. For this reason, the necessity of the land reclamation has been investigated under IWRM considering a balance in the supply and demand water and water quality, soil characteristics, climate, consumption water need and economic value by crops.

Keywords: Water Scarcity, Northern Cyprus, IWRM, Land Reclamation, Water Balance

029 - MINI HYDRO POWER PLANTS -"GREEN" POWER FOR USERS

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The key role of quick development is not only the investing in new tehnologies, but also the proper use of the existing human and technological resources, as well as in the development of new programs which can produce the product interesting and competitive on the market. And what is that programme in which we already have the resources, including knowladge, industrial capatities and the market, and which can provides products at the same time, easily sellable on the domestic as well as on the outside market - Which are those products- How to use still unused, renewal and natiral sources, and still with this usage, provide the environmental protection, with new impuls for the establishing new programmes in agriculture, fishing, transportation, water supply.

The answer to all these questions is comprehended in the title: MINI Hydro Power Plants.

These systems, which are designed to operate for minimum of 20 years, are usually `run-of-the-river` systems. This neans they do not require a dam or storage facility to be constructed but simply divert water from the stream or river, shannel it in to a valley and `drop` it in to a turbine via papeline. This type of hydro generating thus avoids the damaging environmental and social effects that larger hydroelectrict schemes cause.

Cost for a typical micro-hydro system varies depending on the project. Experience shows that community capital, financial credit and improved income make these schemes economically viable and sustainable.

Keywords: mini hydro power plants, natural resources, environment.

038 - EFFECT OF PUMICE ADDITION ON AVAILABLE WATER CAPACITY OF DIFFERENT SOIL TYPES

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In recent years, water conservation has become a vital issue since water, which is one of the basic substances for the life of the living things, is not equally distributed on the earth; therefore, it makes life miserable in some areas. In order to over come this situation, human being has been trying to various methods to eliminate water inadequacy. For example, to meet water deficiency in plants and to achieve a sufficient growth irrigation methods are applied. On the other hand, unless species of the same plant grow in the same soil conditions they need different amount of irrigation water depending upon soil types. In order to keep water in the soil as long as possible after an irrigation event some additional materials such as perlite are added into the soil.

In recent years, it was noticed that pumice is used for this goal due to having a potential for increasing water holding capacity of the soils and causing a better plant growth. But we have not met with any scientific evidence about its effect on water holding capacities of the soils.

Therefore, objective of this study was to determine if pumice additions with two different ratios into different soil types increase available water capacity of the soils. For this purpose, grounded pumice particles smaller than 2 mm diameter were mixed into loamy sand, clay, sandy loam, clayey loam, and loamy clay soil types with a ratio of 1/4 and 1/2 on weight basis.

Results indicated that pumice addition with a ratio of 1/4 increased available water capacity of loamy sand and clay soils while decreased those of sandy loam, clayey loam, and loamy clay soil types compared to unmixed control samples. When pumice particles were added with a ratio of 1/2 into the same soils, available water content of loamy sand, sandy loam, loamy clay, and clay soil types was significantly increased but those of clayey loam soil types was decreased.

Keywords: Pumice Material, Soil Type, Available Water Capacity, Pumice Material-Soil Mixture, Water Depletion.

039 - TRANSBOUNDARY GROUNDWATER BETWEEN BULGARIA AND ROMANIA IN DOBRUDJA/DOBROGEA AREA

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The groundwater aquifers are the major source of water supply (including drinking water) and irrigation in north-eastern Bulgaria (Dobrudja area). The water quality of the main aquifers in Dobrudja area has locally deteriorated as a consequence of agricultural and industrial activities. There is also evidence of overabstraction of aquifers. This leads to problems associated with nitrate pollution, seawater intrusion in local places, and depletion of groundwater resources. Likewise, the reports from Dobrogea (south-eastern Romania) indicate deterioration of groundwater quality, notably increased nitrates cointent.

The overall objective of the project "Transboundary Groundwater Between Bulgaria and Romania in Dobrudja/Dobrogea Area" was to develop and establish an integrated management of the transboundary groundwater between Bulgaria and Romania in the project area. The purpose was to define and implement basic transboundary groundwater management tools including a joint monitoring programme in the Dobrudja/Dobrogea area, and water resources evaluation tools (models, databases and information systems, etc.).

In addition, the project was to assist in establishing a Border Groundwater Coordination Committee (BGCC) and in formulating a three-years training programme. Every project component contributed to the institutional capacity building of all beneficiary institutions in Bulgaria and Romania.

The project was of one year duration ending in November 2007 and executed by the consortium of EPTISA (Spain) and DHI (Denmark). As a PHARE CBC (Cross Boundary Cooperation) project its main purpose was to present Technical Assistance to ensure transboundary groundwater management using the Water Framework and Groundwater Directives.

The project had five main components: (1) Data collection and assessment for elaboration of the Joint Monitoring Programme, (2) Development of Joint Transboundary Groundwater Monitoring Programme; (3) Selection and validation

of a Groundwater Model; (4) Establishment of Joint Bulgarian and Romanian Groundwater Information System; and (5) Institutional Capacity Building.

All these activities were interlinked. Data collection and assessment was the key input to developing a monitoring programme, making a groundwater model, and to establishing an information system. All information from all institutions in both countries were compiled, analyzed, processed and presented as a Baseline Analysis Report (BAR). The report, produced on a CD with over 600MB of information included all categories of groundwater, meteorological, climatological, water quality and water use data, many legal documents, various reports, GIS maps, etc.

The Joint Groundwater Monitoring Report interpreted the past, current and future monitoring networks for groundwater quality and quantity observations across and near the border. Following the requirements of the Water Framework Directive (WFD), it recommended coverage, size, list of constituents and parameters, their frequencies, methodology of sampling, storage and processing, for both surveillance and operational monitoring.

The project built a transboundary mathematical model of integrated surface- and groundwater system covering about 15,000 sq.km (10,000 in Bulgaria and 5,000 in Romania). The model was built using the MIKE SHE software, and the groundwater system was discretized into 7 layers. An important part of the project was training in using the modeling software and in building and calibrating the model.

The Ground Water Information System (GWIS) component resulted in an Oracle-based GWIS with dedicated groundwater storage and retrieval applications programmed by the project.

The Institutional Capacity Building component delivered many dedicated workshops, seminars, hands-on training sessions, culminating with recommending a 3-year training programme in various groundwater-oriented disciplines.

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041 - EFFECT OF DRAINAGE ON AGRICULTURAL EROSION AND WATER QUALITY

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A proper design and operation of a drainage system could satisfy both off-site environmental concerns and on-site agricultural requirements. The objective

of this research was to evaluate the effectiveness of subsurface drainage on reducing soil and nutrient erosion and surface runoff. A study for obtaining the information about the effect subsurface drainage on soil and nutrient erosion and water quality was conducted from 1992 to 1995 in Korça province, southeastern Albania [400 35' N, 200 46' E, elev. 899 m]. The results taken by this study show that drainage system affects the proportions of water leaving the field via surface and subsurface flow. Systems that depend on surface drainage tend to have higher rates of runoff (-54%) with more sediment (-28%), phosphorus (-48%) and potassium (-37%) than do systems with good subsurface drainage. Subsurface drainage systems may be also a preferred water table management practice for improving the water quality of water leaving agricultural fields reducing the ammonium-N (-25%) and ortho-P (-20%) concentrations. Thus, subsurface drainage can be managed to reduce their potential for agricultural erosion and contamination of groundwater and surface water resources.

Keywords: soil erosion, nutrient erosion, subsurface drainage, Albania.

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045 - HYDROLOGICAL HERITAGE IN THE GEOHERITAGE AND NATURE PROTECTION SYSTEM OF SERBIA

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This paper deals with nature protection system in Serbia with activities for protection of nature sites and their complex contents, management, expert surveillance, education and promotion. Special attention is paid to protection of surface waters in the light of great strategic significance of water resources and absolutely certain drinking water crisis in near future.

A new term has been introduced as well - hydrological heritage and its place in the Serbian and European geoheritage frame; within categories of protected natural properties a new one is proposed - water reserve with the aim to emphasize the importance of direct protection of surface waters as the result of evident increase of the need for drinking water as a global trend.

In the Summary of Protected Natural Properties of Serbia, where the water has a dominant role, it is pointed to the current conceived importance of surface waters protection as well as the need to pay to this subject adequate and great attention. Introduction of new terms in the nature protection concept of Serbia, protection

of new sites with the aim of conserving reserves of drinking water for the future generations has been proposed as well.

Keywords: hydrological heritage, water reserve, nature protection, protection of water resources

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053 - WATER MANAGEMENT BALANCES ASSESMENT OF A RIVER BASIN WATER RESOURCES SYSTEM IN BULGARIA

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A short description and analysis of the existing situation in water resource use of North-Western Bulgarian basic river basins are given. The similarities, differences and specific peculiarities of water resource consumption for each of the basins are outlined. For determined sites of the river net, the basic statistical characteristics of the natural run-off (for the period 1961-2004) and the percentage monthly distribution are applied. The water management balances (WMB) are made on the basis of developed schemes for water resource use in each basin at different variants of the users' demands. The obtained results of the WMB and the water supply reliability assessment are commented. The problems and some principles of the available water resource use in the basins are discussed. In the results the advisability of planned basic tendencies and recommendation of measures system for development and improvement of water resources management to be achieved their rational use in the region, is well grounded.

Keywords: river basin, water management balance, water supply reliability, water resources management, reservoir operations simulation model, network solution algorithm, complex river systems, water distribution, time series.

061 - SOUTHEASTERN ANATOLIA PROJECT (GAP) IN TURKEY AS A WATER RESOURCES MANAGEMENT

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The Southeastern Anatolia Project (GAP), one of the most important projects for develop remarkable natural resources of the world, is accepted as a change for getting benefit from rich water and agricultural resources of the Southeastern Anatolia Region.

The GAP Project has been considered as a regional development projects through years, but the dimensions of sustainability, protection of environment and participatory have been attached to the master of the project in recent years.

When the GAP Project is completed, the Upper Mesopotomia, the centers of many civilisation, will re-again its importance as it had in the ancient times, and will be alive a center of civilisation. Moreover, when the problem of water shortage and water supplies in the world for the future is kept in mind, the importance of Southeastern Anatolia's water supplies will be doubled. For this reason, the GAP Project, developed by depending on water and natural resources of the region, will have an important place in the world.

The aim of this study is to introduce the region with rich natural resources and the GAP Project. For this reason, firstly, the natural potential of the region will be introduced. Second, The GAP Project will be presented in detailes. In the third stage, the projects being processed for protecting the natural sources and environment will be analyzed. In the last stage, strategies and policies to develop and to protect the natural resources of the region in short, mid, and long terms will be proposed.

JEL Codes: Q2, Q3, N55, O53

Keywords: Natural and Water Resources; Turkey; Southeastern Anatolia Region and Southeastern Anatolia Project (GAP).

064 - HYDROECONOMIC MODELING FOR WATER RESOURCES MANAGEMENT: THE NILUFER BASIN, TURKEY

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Integration of hydrologic, economic and institutional principles offer policymakers a way to combat poverty by systematic management of water. Managers need to understand water supply, how much will be needed, in what quantity and quality, for how long, and for what uses. Hydroeconomic optimization models integrated at the river basin scale provide a rich framework for identifying comprehensive policy decisions that reduce water poverty. This paper describes the development and use of a hydroeconomic model for the Nilufer River Basin of Turkey. The city of Bursa is located in the southern Marmara Region of Turkey and is an important agricultural, tourist and industrial center. With Bursa-s continued economic growth and development, increasing water demands require its efficient management among sectors and time periods. Designed to be solved using conventional optimization methods, its process can applied to other river basins worldwide. Results present important policy options at the local level in terms of water pricing, storage, use, protection, and quality.

Keywords: Basin scale analysis, Water policy, Integrated Water resource management

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065 - TURKEY-S CHALLENGES OF RIVER BASIN MANAGEMENT IN THE IMPLEMENTATION OF THE EUROPEAN UNION WATER FRAMEWORK DIRECTIVE

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Efficient water resources management has increased in importance on the world agenda due to the adverse impacts of global warming in recent years. Access to safe water resources is a basic human right and it is emphasized during

international conventions and conferences that every government should provide enough water for its citizens. One of the most comprehensive policy documents is the Water Framework Directive (WFD) of the European Union (EU). The WFD is important to Turkey because the nation is a candidate for entrance into the EU and will need to conform to the various EU legislations. However Turkey faces various challenges in the implementation of this comprehensive directive. The aim of this paper is to present Turkey-s current water resources management experiments and compare them with those of the EU. The research examines Turkey-s basic challenges in the implementation stage of the management plans within the context of the WFD. The results of this research provide important policy recommendations for EU countries and Turkey.

Keywords: European Union, Water Framework Directive, Water Policy, Water

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097 - EFFECTS OF CHECK DAMS IN THE TORRENTS OF THE TOPLICA RIVER BASIN

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The organized activity in erosion and torrent control in the territory of Serbia started in the beginning of the XX century (1907 year). The first works refer to torrent control and channel training in the zones of intersections with railway, aiming at railroad protection.

All the erosion and torrent control works can be classified in two groups:

- Technical works (including all the construction engineering works made of concrete and stone masonry in the channel- transversal and longitudinal structures)
- biological works (including all the areas where biological works were carried out in the watershed, such as afforestation, reclamation, grassing, establishment of orchards, shelterbelts, wattles, coppice reclamation, terracing contour farming, etc.).

The effects of the transversal structures are evaluated by the slope of siltation upstream of the structure and the quantities of deposited sediment.

The paper presents the effects of the constructed transversal structures (check

dams) in the torrential tributaries of Toplica river drainage basin upstream of the future water reservoir "Selova", and the effects of some channel and sediment characteristics on the slope of siltation.

Correlations between the newly formed slope of siltation (Iz) and the natural bed slopes (It), particle -size distribution of sediment and coefficient of sediment nonuniformity in the torrents were analyzed. The study results show the significant correlation between the slopes of siltation and the particular factors. They are the basis for further forcasts of the slopes of siltation, as a very important factor in the process of design of check dams for torrent control.

Keywords: torrent, slope of siltation, particle-size distribution, check dam, effects.

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126 - PROBLEM OF FLOATING DEBRIS IN THE STORAGE RESERVOIRS OF BAJINA BASTA AND POTPEC HYDROPOWER PLANT

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In recent years it was recognized that there is an increase of floating debris in the water of many rivers and lakes in Serbia. Components of debris were different from the natural river debris and waste from from trees. At same time debris seems to be similar to municipal wastes.

Much of non-sanitary waste disposal are located in floodplane area. Most of municipal wastes could float at water surfice, and became a floating debris. Part of that material are non-degradable in nature and could be transported far from the place of its source. In the transport debris could be accumulated around the obstracle in water, such as, dams, bridges, dykes, boats, ships, islands, causing environmental polutions, demages and negative visual aspect.

Because of the debris accumulation in the storage reservoir of Bajina Basta and Potpec hydropower plants, research which was done, gave some answers about the source, assesment of the amount, components, loss of electricity, adverse effeects, and mitigation measures. Besides that, such research had to give

recomentadions for similar problems in the other power plants in exploitation such as new ones.

Keywords: floating debris, municipal waste, storage reservoirs, environmental pollutions

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156 - PRESENT EXPERIENCE AND RECOMMENDATIONS FOR NEW APPROACH TO USING HYDRO POWER POTENTIAL OF SMALL WATER COURSES

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European Union with its Directive no 77 of 2001 set the goals for its members, and those are to have 12% of energy produced on the basis of using the renewable energy sources.

In general, the most important renewable resource of Serbia and BaH is their hydro potential. The remaining, technically usable hydro power potential in Serbia is around 7000 GWh, of which almost 25% relates to the small hydro power plants (up to 10 MW). At around 900 potential locations on rivers of Serbia, including the small rivers, where small power plants can be built, with production of around 1800 GWh a year. The law on energetics and the Strategy of development of energetics of the Republic of Serbia till 2015 (2004/2005) the new energy policy of Serbia was promoted, in the context of adapting to parctice and regulations of EU in this field, and attainment of European and global standards in respect of environment protection, and one of the priorities is usage of renewable energy sources. Among other things, the hydro-potential of small river course (with facilities up to 10 MW) found themselves in the framework of the new category «renewable energy sources»).

Hydro power potential of Bosnia and Herzegovina has presently been used with 40%, which presents a possibility to assume a leading role in this sector, primarily

in respect to the surrounding coutries which already used thier potentials, and remained the importers of electricity. It is estimated that hydro power potential of small water courses, which would allow constrcution of small hydro power plants in BaH is around 2000 GWh. BaH has to pass the strategic documents in order to define the new energy policy, in order to synchronize with practice and regulations of EU, and to implement the global goals of sustainable development and in this context, to develop the system, that is, the support strategy to use the renewable energy sources.

This paper presents the place, role and importance of small hydro plants for long term development of energetics in Serbia and BaH, in the context of encouragement for the sustainable development. Also, the paper presents the experiences in construction of small hydro power plants, with the example of building of 4 small hydro power plants in Fojnica municipality (BaH), starting from an idea (1999) until realization (2004). The construction of these plants by the «Intrade energija» of Sarajevo (baH) demonstrated and proved that construction of hydro power facilities through consessions is possible, especially having in mind that those are the first hydro power plants constructed on the basis of this principle in ex-Yugoslavia. On the basis of this experience, the recommendations were produced, in order to promote a totally new approach to the development of this kind of energy production. An illustration is the proposition for usage of a part of water potential of around 40 MW in the area of Zajecar (Serbia) for production of electric power, though construction of small hydro power plants, with a sketch plan.

Keywords: sustainable development, renewable energy sources, small hydro power plants.

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161 - INTEGRATED WATER QUALITY MONITORING IN BANAT CATCHMENT AREA

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Water means life. In the last decade because of the pollution water's control becomes a major priority. The water quality monitoring has been developed very fast on the international plan. The monitoring become in present an active system for intervention, control and evaluation of efficient measures for settlement. It is to promote unpolluted technologies. The paper presents the structure and the

organization of integrated water quality monitoring in Banat catchment area. The development of monitoring system implies the following steps: to increase the number of monitoring's subsystem, the number of monitoring's sections, to define new monitoring's programs, etc. The last part of the paper draws out some conclusion regarding the water quality on this catchment area.

Keywords: water quality monitoring, integrated water management, EU Water Framework Directive, sustainable development

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162 - ANALYSIS OF THE INTEGRATED WATER RESOURCES MANAGEMENT APPROACH: TURKEY-EU WATER RELATIONS AS A CASE-STUDY

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Integrated Water Resources Management (IWRM) approach which upholds the implementation of environmental and economic principles at the river basin level is imposed by the evolution of water problems in the industrialized world. The current consensus on IWRM is the result of a reorientation after a century of development in which the water sector was faced with a number of serious problems. The IWRM approach includes a combined, holistic management of ground and surface waters, paying due attention to water and land resources use in river basin; it also identifies interactions between upstream and downstream users as well as the political relationship between the planners, providers, and users.

The paper analyzes the IWRM approach through an historical narrative while emphasizing the divergences in the priorities and requirements of the developing and developed countries. Then, the paper examines water resources management in Turkey taking into consideration the political economic structure of the country. Turkey, being the accession country to the European Union (EU), undertakes various obligations in the adaptation process to the Union. Since the late 1990s, the EU has embarked on the implementation of the IWRM within its political geography. Hence, the paper looks into the making of the EU water policy since

the 1970s with particular attention to the Water Framework Directive (WFD), its basic objectives and rules as well as the compatibilities and differences of it with the Turkish water policy.

Keywords: Integrated Water Resources Management, Turkey, European Union water policy

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180 - ASSESSMENT ON ROCK FILL SMALL DAMS FOR WATER DEMANDS OF VILLAGES (CASE STUDY: NORTH OF FARAHAN)

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About 70 percent of Iran located under Arid and Semi arid climates and has irregular rain that focus on winter rainfall. Rainfall that occurs in this area has less time length and high intensity that makes floods. Floods cause various damages to agricultural lands, bridges, buildings, etc.

In northern part of Markazi province (Farahan), numbers of small rock dams were built to control and utility of floods that can lead to downstream villages and during this research, operation of these dames were analyzed, especially about their economically and water supply points of view.

For this purpose questionnaires were prepared and filled by villagers that contain information about the value of their crops and related income before and after construction of rock dams.

Results of this research show these dams not only in order to protect downstream from floods, but also to store water for dry seasons. These dams cause increase at farmlands area and efficiency these results were at the situation of traditional irrigation system that could be more efficient with more investigations.

Keywords: Water resources, Rockfill small dam, village, water demand, production

195 - ASPECTS OF THE INTEGRATED WATER RESOURCES MANAGEMENT OF THE STRUMA RIVER BASIN

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Water resources scheme, simulation model and GIS for the transboundary river basin of Struma have been developed as a part of the River Basin Management Plans (RBMP). The transboundary character of the river basin requires integrated water resources management. All considerable water resources and hydraulic relations between the water users and the environment are taken into consideration for the graphical scheme. The programme SIMYL has been applied and the functioning of the water resources system has been analyzed in different variants for water consumption and water resources. The calculated disturbance of the run-off at different stations in the river basin was given as an assessment of the anthropogenic pressure. Critical sections have been determined in accordance with the Water Frame Directive (WFD).

The possible decisions of the basic problems of the river basin are analyzed in order to assist in the decision making process of integrated water resources management in the West Aegean Basin Directorate of Bulgaria.

Keywords: Integrated Water Resources Management, Water Resources Balances, River Basin Management Plans, WFD, anthropogenic pressure.

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213 - AN ASSESSMENT OF TECHNICAL EFFICIENCY OF THE RAINFED AGRICULTURE UNDER WATER HARVESTING SYSTEM IN ARID REGION: CASE OF THE WATERSHED OF OUED OUM ZESSAR (SOUTH-EASTERN TUNISIA)

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Because of its geographical situation between the Mediterranean and the Sahara, Tunisia is among the countries the least equipped in water resource in the Mediterranean basin. The potential water resources, including subsoil waters

are limited to 4700 million m^3, of which only 4000 million m^3 are mobilized by hydraulic installations (Zahar, 2003). In arid region, and more precisely in the south-east of Tunisia, the harvest of surface waters constitutes an alternative resource in front of the scarcity and the weakness of the subsoil water resources. This water collected by a multitude of soil and water conservation (SWC) works, plays an important part in the operation of not irrigated agricultural systems of production, majority in the area (Sghaier et al., 2002).

The aim of this paper is to estimate technical efficiency of the rainfed agricultural based on water harvesting in arid region. Technical efficiency for a sample of farms in the Oued Oum Zessar (south-eastern Tunisia) watershed has been evaluated.

Both a non-parametric and a parametric approach to a frontier production are used and the differences in the results are discussed.

Results show that rainfed farming efficiency is relatively satisfied with 74% and 70% of parametric and non-parametric approach.

Keywords: water harvesting system, technical efficiency, rainfed farming, arid region, watershed, Tunisia

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216 - SCENARIOS FOR DEVELOPMENT OF BULGARIAN POWER SECTOR AND PROGNOSIS OF CO2, SO2, NOX AND DUST EMISSIONS

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Two base scenarios for the least-cost development of the Bulgarian power sector are considered for the period 2000-2020. They follow the latest minimum and maximum demand forecasts. A «lignite coal» version of the maximum scenario is also discussed. The optimisation procedure during scenarios calculation insures final solutions optimal from technical and economic point of view. It is focussed on four pollutants - CO2, SO2, NOx and dust taking into account that a significant part of the national emissions of these pollutants is due to the power sector. Proper emission reduction scenario is applied so that the emissions would be minimized and under the respective emission limits, defined by the Directive

2001/80/EC. The results show that the application of the abatement measures in this scenario will be sufficient to obtain the emissions of the considered pollutants below limits after 2008.

Keywords: power plant, prognostic, pollutant, power demand, scenario, emission limit

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228 - TENTATIVE ISSUES RELATED TO WATER MANAGEMENT MODERNIZATION

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Regarding the identification and development of water resources it is necessary to analyse scope and evolution of water resources planning, relevance of water resources planning for drinking water supply, process of water resources planning and management, aspects of water resources management, water resources management and the drinking water supply sector, governmental involment in water resources planning, regional and sectoral planning, hierarchical structure of water resources planning, time focus of water resources planning, systems analysis approach (inception and analysis stage), integrated approach to development, management and use of water resources, transfer of irrigation management services, farmer participation and irrigation organization, capacity self-assessment within the thematic area of land degradation and desertification, and models and databases in water resources planning (overview of models in water resources planning and computational framework studies) for one semi-arid area like Macedonia.

Keywords: Identification and development of water resources, management of irrigation systems, water resources management, transfer of irrigation management services, BHIWA model, drip-irrigation

231 - WATER QUALITY MODELS APPLICATION IN VOJVODINA CANAL NETWORK, SERBIA

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Quality of water in the canal network of the Hydro-System Danube-Tisza-Danube in the Province of Vojvodina, Serbia, has been influenced by a number of factors. Although, predominant influence comes from agricultural run off, and effluents from food processing industries, urban run off and pollutants coming from municipal waste waters and other industries are also significant. Since the problem of water quality in the canal network is complex for its overcoming modern integral approach needs to be considered. The integral approach is based mostly on requirements of Water Framework Directive of the European Union, as well as on concept of Total Maximum Daily Load developed by the United States Environmental Protection Agency.

Integral water quality management involves use of the Geographic Information Systems (GIS), and lately more often tools are complex water quality models, which are used for simulation, and analysis of different processes in water bodies. The paper tends to present prospects of using integral approach and complex water quality models in order to contribute to better assessment and prediction of processes in canal network in the region of Vojvodina. Some successful applications of QUAL2K model are presented as well. Finally, the paper offers suggestions for further directions of research, as well as the possibility of their implementation in the regulative framework of the Province of Vojvodina.

Keywords: canal, water quality models, enviromental protection, QUAL2K

232 - APPLICATION OF FFBP METHOD IN IRRIGATION RESERVOIR MONTHLY INFLOW SIMULATION

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Water resources limitation, aim variety and financial sources inadequacy make the managing of optimum releasing to be a great necessity. The undesired temporal and spatial distribution of rainfall, strategic situation of agricultural crops and complicated systems of water resources all are caused the application of mathematical models to be a necessity. On the other hand the stochastic property of inflow to the reservoir system makes the forecast of operation rules in reservoirs to have great importance for irrigation of farmlands. The aim of simulation technique is to predict a behavior of reservoir system in future operation periods. Decision makers make a good management for system operation by application of different scenarios.

Sabalan dam reservoir with 90 hm^3 active capacity was constructed to irrigate 1200 ha agricultural lands in Ardabil province. The monthly water demand of down stream agricultural lands assumed to be supplied perfectly. In this research to along dam reservoir operation forecast namely storage value, spill, evaporation and precipitation over Reservoir Lake the multi-layer feed forward back propagation ANN method used for simulation of reservoir inflow. The reservoir continuity equation was solved for both cases historical flow and simulated one for the purpose of reservoir parameters calculation parameters obtained from both cases of inflow were compared. The results showed the best consistency observed and calculated parameters.

Keywords: Reservoir Management, Reservoir Simulation, Optimum Operation and Artificial Neural Networks.

237 - SOCIAL RESPONSIBILITY AND 'DEVELOPMENT SPENDING' AND WATER MANAGEMENT: THE SOCIAL QUESTION ON INTEGRATED WATER MANAGEMENT

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The concept of social entrepreneurship and social enterprise has become the catchword of new development debate as never before. The theoretical debate it carries over to society is highly debatable. In principle these are attached to the socially required development assistance and services. This paper is on this significant aspect of social enterprise. In the contemporary development debate the involvement of community organisations are termed as the mode of social enterprise. The role of social groups to maintain and run the service like drinking water schemes, micro-credit etc are the come under this category. Hence this paper argues that the sustainability of social entrepreneurship in a socially backward society is hardly possible unless state and the public support it. The paper again argue that in the neo-liberal development debate state has no social obligation to ensure the sustainability which require financial support. The paper propose this debate with the experience of one of the community controlled and world bank aided drinking water scheme in Kerala, the southern state of India.

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239 - ENVIRONMENTAL IMPACT ASSESSMENT OF THE CASPIAN OFFSHORE PROJECTS: OLD PROBLEMS, NEW SOLUTIONS

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The problem of adequacy and effectiveness of Environmental Impact Assessment (EIA) in offshore oil and gas industry is discussed. It is noted, that "the principles of EIA practice" and the methods of EIA developed for the open seas, such as the North Sea, Mexican and Persian Gulf, north-east part of the Atlantic Ocean, shall be thoroughly reviewed with consideration of the complicated and unique conditions of the Caspian Sea, in particular in the context of sustainable management of Caspian bioresources.

It is mentioned that at present, the theory of EIA is at a low level. It is also noted that methods of EIA included in the "EIA Guidelines for the countries-members of GIS" (Moscow: UNEP, CIP, 2003), are 20 years old and are not sufficient to compile EIAs for the Caspian projects.

Main EIA principles are identified in the presentation; they reflect specifics of oil and gas production in the Caspian Sea and the new paradigm of marine ecology which formed during the last decades. For implementation of the principles, a model platform is proposed. The platform is based on new test, monitoring and information technologies and computer science (ideas and methods of artificial intelligence, knowledge-based expert systems, GIS, Internet, remote sensing etc.).

It is noted that implementation of EIA methods in the context of Caspian bioresources management is connected with the following conditions:

1. The necessity to develop a joint regional model platform of EIA which can be adjusted to the conditions of different areas of the sea, to certain Contract Areas and projects;
2. Application of situational limits to the platform which would exclude conceptual errors during the identification of: criteria and scale of EIA; systems of acute, sub-acute and chronic testing; permitted concentration of emissions, discharges and scope of re-injection of cuttings; it would also allow to avoid inconsistency of interpretation and extrapolation (also in transboundary context) ;
3. Development of a legal base of EIA environmental expertise, which will allow for active participation of the Commission for Aquatic Bioresources of the Caspian Sea and the leading regional fishery research organization.

Keywords: Caspian Sea, Oil and Gas, Production, Environmental Impact Assessment, New Approach.

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242 - THE SUSTAINABILITY OF WATER RESOURCES AT AREAS VULNERABLE TO DROUGHTS : THE CASE OF GREECE

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Under the general framework of a development design concerning the European Community space, one of the most strategic matters that emerge is the possibility of a rational supply of water to cover all the human activities, allowing for a

balanced expansion and evolution at the each various regions. The solution of this problem becomes even more awkward at regions vulnerable to droughts, a natural phenomenon with an increasing frequency of appearance as a function of water consumption. Drought is becoming a social and economic problem with great impact on the peripheral strategy. In Greece the water demand continues to increase, while sometimes is independent from the existing climatic conditions.

In Greece and other Mediterranean countries, the temperatures are favourable and the soils are of good quality, leading into a thriving of irrigation agriculture. At the same countries the rainfall is low and therefore the droughts stop to be considered anymore a meteorological phenomenon, and it is not faced as a structural problem.

In addition to the problem of droughts, phenomena such as flash floods and restrictions of water supply for various uses can be added up. The deficiency of structural solutions jeopardizes the dynamic production of the affected regions as well as the land use itself.

In order, therefore, an integrated use of water resources to be achieved, it is necessary to confront the problem of water demand under a simultaneous searching of its productive use not only from technical but also from an economic point of view.

As a consequence, in Greece the search for a more sound water resources management has to take into account the following aspects:

- The engineering aspect, which turns towards a better utilization of regulation means and towards a prevention of water losses from pipes and distribution networks.
- The coordination aspect, which attempts under the existing natural means to satisfy the water demand with the minimum possible water consumption, and finally,
- The economic aspect, which tries to distribute the water, with emphasis on the economic activities, making use of economic criteria similar with those used for the distribution of natural resources under risk, without the uniqueness of the source to be neglected. The particularity of a water source plays an important role not only from an ecological point of view but also from the view of the conservation for the social and geographic cohesion.

Keywords: Sustainability, water resources, vulnerable areas, droughts, Greece

247 - APPLICATION OF CONTEMPORARY SIMULATION MODELS FOR MANAGEMENT OF WATER RESOURCES SYSTEMS

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Water management during the exploitation of complex multipurpose water resources systems, composed of reservoirs and diversions, can be achieved by using two approaches: (1) optimal models, where an operational research method is used to obtain the optimal trajectory of the states of the system and (2) simulation models, where a normative method of mathematical programming - which directly leads to optimal trajectory of the active storage's states - is not applied. The simulation approach includes selection of the most favourable operation rules with the usable space of the reservoir, which is the singular element that makes these systems essentially controllable. These rules are based on the determination of the most appropriate reduction of the releases from the accumulation for the priority water-users in the drought periods. In general, the simulation models could be applied in water resources management tasks by using two methods: (a) conventional method, using the flow duration method, and (b) contemporary method, using a sequential stream flow routing method. In this paper is presented a brief outline of the contemporary simulation models (algorithm description, results and conclusions) which are applied in the recent hydraulic engineering practise in the Republic of Macedonia.

Keywords: Simulation model, Water resources system

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263 - DRAINAGE - IRRIGATION SYSTEMS AS POSSIBILITY FOR RATIONAL AND EFFECTIVE USE OF WATER RESOURCES

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Agricultural lands with seasonal high level on the underground water in Bulgaria are above 2 million dka. The drainage systems, built in these lands, are mostly conventional drainage type. They ensure reducing of the underground water

table, but on account of their uncontrolled operation, the top of soil layer dries without the wants of the growing crops. This is the reason that the conventional drainage systems do not meet the contemporary requirements for rational and economical preserving and use of the water resources.

Long-term possibilities for raising the effectiveness of the built conventional drainage systems are opening by realizing appropriate technical determinations of reconstruction and improvement of the drainage construction and applying of suitable controlled regime. With reference to clarify the above mentioned problems was made analysis of adequate schemes and resources for reconstruction of the existing conventional drainage systems and making them drainage-irrigation systems.

The studies carried out to determine the possibilities for meeting the water needs of grain maize by working with different types and construction of drainage-irrigation systems show, that in managing of the high underground water, their participation in evapotranspiration of the crops leads to decreasing the irrigation rates. During the 3 test years, the highest yield of grain maize was received in the variant, simulating the operation drainage - irrigation system with subsurface irrigation. The lowest yield made the variant without surface irrigation and without managing of the underground water table.

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271 - ESTIMATION OF RISKS AND OF DAMAGES FROM POSSIBLE NATURAL AND MAN-CAUSED CATASTROPHES AT GROUND DAMS IN ARMENIA

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Armenia is the region of the Caucasus, which is exposed to many natural catastrophes, but the most dangerous is the impact of earthquakes and floods. Earthquakes and floods may cause dam failure, though the dams can be destroyed by the causes, which are not related to natural catastrophes. At present in Armenia there are 82 dams, most of which are embankment dams. Armenia is one of the countries with high density of population and location of dams. Most of the dams are situated in high land areas of 1500 - 2500 m above the sea level.

Some dams, being under the auspices of the Government, are regularly monitored with different success.About 50 small dams are currently not monitored and could

present a real hazard.These dams are hazardous for population and infrastructure in downstream. Classes of risk for dam are necessary for definition of priorities for inspection, rehabilitation works and early warning system installation.

Most rural dams in Armenia were built during 50-70 years of last century. In generally construction was made without qualified organization involvement and as a rule, there are no controlling and measuring equipment on rural dams. The statistical data testify, that floods and internal erosion constitutes and primary cause of concern. In Armenia Bere has been one essential failure of an embankment dam higher than 15m, but as the total of 80 large and small built, the certain part is maintained with various defects (infringements). The part of them had sustained damage to their upstream slope protection, about 10 had suffered internal erosion, on 11 dams had been affected by excessive or differential settlement

Assessment of risk is based on characteristics of the dam and reservoir (for example, its design and general condition and the way in which it is operated and maintained), and on human losses in the downstream caused by dam failure and related flood.

For the decision of the listed problems, it is necessary to develop and improve technologically sold methods due to the estimation of Influence of all the variety of factors upon the safety of the ground dams of Armenia for creating the system (due to IT and GIS technologies) of estimations of risks and of damages from natural and man-caused (technological) catastrophes at ground dams in Armenia.

Keywords: Ground dams, Risk Water Resources Management, Natural and Man-caused Catastrophes, System of estimations of risks

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277 - EFFECT OF DIFFERENT LAND USES BY USE FRN'S METHODOLOGY FOR OMERLI WATERSHED MANAGEMENT

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Industrial developments and population increase cause high consumption of soil and water resources, and demand for food and agricultural products is increasing day by day in Turkey. In order to meet this demand, illegal open spaces from forest and rangelands are created for agricultural purposes. Therefore, land-

misuse is the main reason for soil loss through erosion and sedimentation of fresh water reservoirs in Turkey. In this frame, objectives of this study were to investigate effect of different land use types on soil erosion in the environs of Omerli Reservoir in Riva Basin, which is the main fresh water source of Istanbul mega city, to provide information required for assesing a sustainable management of the Omerli watershed in Riva basin and thus to protect land and water resource in the watershed. Ballica (cultivated site), Pasakoy (pseudo machie) and Esenceli (rangeland) villages were selected as study sites and soil erosion rates were determined using fallout radionuclides (FRN's) methodology. Results show that soil erosion is a serious problem at the site and soil loss was above tolerance limit of 10 t/ha/year for deep brown forest soils in Turkey.

Keywords: Fallout radionuclides, 137Cs, Omerli, watershed, soil loss, erosion, land-misuse

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286 - WATER QUALITY MODEL QUAL2K IN TMDL DEVELOPMENT

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Processes that take place during the self-purification of water streams are one of the most complex ones in nature. Modern science and practice wants to describe and control these processes with the improved awareness of sustained development. Self-purification depend on many physical, chemical and biological parameters. Precise description of causality of change in parameters in space and time, using mathematical models such as QUAL2K, will be invaluable for water management practice.

Planned research, based on theoretic research, laboratory measurements, direct field measurements and mathematical analysis, have been performed on the section of channel KC-III drainage system Vrbas. From the ecological point of view, channel represents the black point and it is one of the most polluted channels in Serbia.

A TMDL is the total amount of a pollutant load that can be assimilated by the receiving water while still achieving water quality criteria. The TMDLs developed for the channel KC-III illustrate the steps that can be taken to address a waterbody impaired by waste water.

Keywords: water quality, QUAL2K, TMDL, sel-purification

291 - ENVIRONMENTAL IMPACTS FROM POWER GENERATION SYSTEM IN MACEDONIA

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Energy sector is the main force for the economical development for each country, and therefore has the main impact in environmental pollution. The energy sector consists of few sub sectors as the following: electric power, industry, heating, transport, of which electric power sector is one of the main contributors for the pollution.

The development of electric power sector is analyzed from the aspect of electricity generation in Macedonia for the period of 2006-2025. The goal is to cover the electricity needs, taking into account the existing thermal and hydro power plants, as well as the real possibilities for building the future generating capacities. The analyses have three scenarios for covering the electricity needs. The first scenario is based of the coal (lignite) for the future thermal generating capacities and the second and third ones are the variants for using the capacity of the gas pipeline system for electricity generation.

The hydro power plants as the generating capacities is the most acceptable from the ecological point of view, but as the same time they have the most investment requirements, and on the other side they are energy limited by the geographically position and hydrological conditions. All the existing hydro capacities, as well as the planned hydro power plants candidates will be treated in the scenarios. Some software tools as the OPTIM, WASP and LEAP are using for the analysis of the development of Macedonian power system the system for electricity production. As the output will be presented the energy balance (supply-demand) for the planning period, as well as the environmental impacts of the three scenarios in GHG emissions (CO_2 eq), SO_2 and other pollutants.

Keywords: Environment, GHG (GreenHouse Gas), Emission, Energy, Power Plants

292 - PARTNERSHIP FOR ENVIRONMENTAL POLICY IMPLEMENTATION

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Environmental policy is an interdisciplinary complex field that requires a wide range of options to be considered in parallel. Partnership can be of essential importance for the success of any policy option, especially in the course of its implementation, because actions/activities in the field of environment require relevant social perception and understanding. For this purpose, collaboration between the interested and involved parties - scientific community, policy and decision makers, business companies, non-governmental organizations (NGOs), is necessary.

This is also true for the policy option to raise the public awareness in environmental problems and ways for their solution if sustainable path of future development is to be achieved.

In the paper, partnerships for environmental policy implementation are discussed on the example of policy to address climate change in the case of Bulgaria. Based on results from a study on the role of Bulgarian environmental NGOs in the promotion of energy efficiency measures as a policy option, the establishment and development of partnerships between researchers and NGOs in Bulgaria - as a type of public-private partnership, is analysed. Yet, real and effective partnerships for policy implementation are not common practice in the country, so further efforts are necessary. Special attention is paid to ideas how to improve the situation in respect to the implementation of policy on the use of renewable energy sources (RES), in particular - hydro energy, which in 2006 accounts for 97,2% of the used RES in Bulgaria.

Keywords: environmental policy, climate change, partnership

293 - POTENTIAL AND WATER ECONOMY OF KOSOVO

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In this project are presentation (figured) the water potential of Kosovaas, river, lake, use (maintain), and economically benefits pronouncedly in:

- Flows of Drini I Bardh, with flow 60 m^3/s,
- Flows of Ibri, with flow 33 m^3/s,
- Flows of Morava e Binqes, with flow 7 m^3/s,
- Flows of Lepenci, with flow 8 m^3/s.

Which are characterized (define) with considerable potentiality and most imported (important) for energy production, see at table, No. 1.

Kosova also have six artificial lake which are: Ujmani, Radoniqi, Batllava, Badovci, Perlepnica and Livoqi.

Water from this lake using for drinking - water of Kosova towns, for watering system lands of Rrafshi i Kosoves, and Rrafshi i Dukagjinit.

The maintain quantity for drinking - water and watering system are presented in table No.2.

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312 - RESULTS REGARDING THE TESTING OF THE SYSTEM FOR COLLECTING - STORING - PUMPING WATER COMING FROM RAINFALLS

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The paper presents the results regarding the testing, in glasshouse conditions , of the experimental model of the technical system for collecting - storing - pumping water coming from rainfalls, for a localized irrigation, by means of dripping water inside the glasshouse.The experimental arrangement is located in the glasshouse arranged site from the Research and Development Resort for Vegetable Gardening (SCDL) Buzau, from within the Academy of Agricultural and Forest Sciences (ASAS) Bucharest. The water resource is represented by rainfalls and underground water.

Its is presented information referring at the water resource, air, the system's behavior while working, the irrigated cultivated plant ,localized by dripping. It analysed the calculus precipitation and its influence upon the hydraulic elements which are condioning leakage.

Keywords: rainfalls, water resource, irrigation, glasshouse, equipment

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314 - ARCHITECTURE DESIGN OF THE MUNICIPALITY OF COIMBRA WATER DISTRIBUTION NETWORK SUPERVISORY SYSTEM

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The municipality of Coimbra, located in the center of Portugal, is a 319.4 km² region with approximately 150,000 inhabitants, of which 100,000 live in the capital city built on the right side of the Mondego river. The water distribution network comprises 93 installations (tanks, pump stations and pressurization units) and extends over 1500 km.

This article summarizes the study conducted to define the architecture of the

new supervisory system that will replace the existing SCADA, which only covers the critical installations. The following strategic objectives guided the project: (1) record operational data to enable a more efficient and profitable exploration of the network; (2) increase the quality and availability of the service; and (3) guarantee the integration of the supervisory system with the already in place management systems, namely the Enterprise Resource Planning (ERP) and Geographic Information System (GIS).

The design of the system architecture, presented in detail, followed a methodological approach. The choice of broadband mobile data communication (GPRS/UMTS) is supported by a brief comparison of the available communication technologies in terms of quality of service and cost. Further, the proposed integration technologies are briefly reviewed.

Keywords: Water Distribution, Supervisory Control, GPRS, UMTS, Integration Technologies.

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319 - HYDROLOGIC INVESTIGATIONS OF "ERZENI" RIVER, AND THEIR INFLUENCE ON THE DESIGN AND CONSTRUCTION STRATEGY OF THE SKORANA DAM

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The Erzeni river, flowing from its stream down to its pouring to the Adriatic sea, has a length of 109km, and a watershed area of 760 km². From the hydrological aspect it is characterized with a mean water discharge of 18,10 m³/s in its pouring to the sea, while in the place where the Skorana dam is planed for construction has a discharge of 5,08 m³/s. Additionally, the Erzeni river is characterized with a flow modulus of 24,00 l/s/km², and a ratio between maximal and minimal water discharge of Qmax/Qmin=11,2.

In the upper zone of the Erzeni river flow, in 20 km distance and north-east direction from Tirana, it is planed to be constructed the Skorana dam. The cross-sectional

profile where it is planed the erection of Skorana dam is very narrow while in the geological aspect, the dam site is consisted of uniform limestone. Based on the topographical and foundation characteristics for the Skorana dam site, the erection of an arch type of dam would be the most economical approach.

In this paper, the main objective is to represent the hydrological measurement data taken for the dam site area, as well as the hydrologic and statistical analysis performed. As a result of these analysis have been derived the probability distribution functions and probability of maximal river discharges for a various return periods. The determination of these results has a direct and strong influence on many issues concerning the development of a feasibility study for the Skorana dam, such as Skorana dam hight, reservoir accumulative capacity, hydrostatic loads, hydrodynamic loads, dam-fluid interaction intensities, as well as the diversion strategies during the construction of the dam.

Keywords: river discharge, hydrologic measurements, statistical analysis, Skorana dam, Erzeni river

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327 - DAMS WITH IMPERVIOUS MEMBRANE OF ASPHALT CONCRETE

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Even though the earth dams have been constructed since the earliest times, it is the increase of our ability to build safer and economical structures, which makes those dams even more acceptable. The earth dams can be constructed with impervious membranes of manufactured materials such as concrete, steel and asphaltic concrete.

Dams build up with impervious membrane are safer against shear failure than any other type of earth or rockfill dam. Consequently, for a given safety factor, the embankment slopes can be made steeper and the embankment volume smaller. Also they tend to be less costly and more easily and rapidly build up than the dams with earth core.

In this paper, the focus is on construction of impervious asphalt concrete membrane as well as some of its general advantages and disadvantages. Also

the circumstances favoring the use of upstream asphalt concrete membranes are given, in order to make easier the decision whether it can be used or not.

Special attention is paid to the critical connection details, at the interfaces of facing-plinth-cutoff.

So, it can be concluded that dams with impervious membrane of asphalt - concrete are concurrent to other types of dams, because of their easy and fast construction, and their lower costs. If the design and construction of those dams is based on favoring circumstances, than the dams with impervious membranes are acceptable and sustainable.

Keywords: Bituminous concrete facings, layers, plinth, dams.

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333 - FORMULATING DECISION SUPPORT SYSTEM IN WATER RESOURCES MANAGEMENT

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Effective water resources development and management are not possible without adequate information. Lately, considerations also made which data are gathered and considered relevant for assessment of water resources development and impact on socio-economics, and dictate quite different approaches towards aggregation of data, and integration of information in the search for improved policies. The literature on water resource information addresses mainly important aspects for reliability of data at local levels based on which national water policy had been formulated. So, policy implementation and its expected impact on socio-economic changes are still misleading especially in developing countries due to the fact that even policy makers are often not aware of type and value of information they need. While extensive policy analysis has been devoted to setting the comprehensive framework for management of water resources, the incorporation into the policy of information needs, regulation, collection and processing, has not yet been recognized as a pre-requisite.

Effective accounting processes are an important component for any management system that led to formulation of many index to serve the purposes. The index developed so far to identify or measure of associated impacts on human

development due to water resources management. However, it can not recognize the unique importance of water to all forms of life. The objective of developing a Water Poverty Index is to produce a holistic policy tool, drawing on both the physical and social sciences. Based on available data and expert opinion by questionnaire survey at national level in Bangladesh, Water Poverty Index (WPI) is calculated in every five year interval during 1970 to 2005. After constructing WPI, correlation matrix is formulated to capture all factors and relation among each others to represent development status, identifying vulnerable sectors need to be addressed properly and guideline for future policy formulation and monitoring tool. It is hoped that the development of such an index will enable decision makers to target crosscutting issues in an integrated way, by identifying and tracking the physical and socio-economic drivers which link water and poverty.

Keywords: Water Poverty Index, Management tool, Water Resources Management.

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341 - PROJECT-PROPOSAL FOR REGULATION OF THE DOWN FLOW OF THE RIVER BREGALNICA (SHTIP-UBOGO) IN THE REPUBLIC OF MACEDONIA

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The down flow of the river Bregalnica is now unregulated and unused in the truthful sense of the word.

We propose the building of an accumulation, which can be used for irrigation, producing of the electricity, for protection of the waters of two rivers Bregalnica and Vardar, for recreation etc.

Keywords: hydrology, irrigation ,ecology,production of energy

358 - BRIDGING THE GAP BETWEEN WATER RESOURCES MANAGEMENT AND INTERNATIONAL INVESTMENT: AN INTEGRATED APPROACH

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This paper is going to argue that the regime of international watercourses law and the regime of international investment are not self-contained, since there are no self-contained regimes in international law.

International law is a horizontal system; there is no hierarchy in its subsystems. Modern international law resembles a dense web of overlapping prescriptions in subject areas as diverse as environmental protection and international investment. The regimes of water management and international investment law, however autonomous may be, cannot constitute self-contained regimes within the legal order. The special regimes should remain part of the legal order and a relationship, however tenuous, must subsist between the two. If such a relationship does not exist the special regime becomes a legal order unto itself and no longer partakes in the same basis of legitimacy and formal standards of coherence.

The present paper is going to highlight that what would provide better results in the conflict between management of natural resources and the need for economic development is a turn to fundamental notions of international society. The return to sustainable development requires a holistic approach to the problem; in other words, an approach which will take into account the protection of the investor, preservation of the environment and promotion of human rights.

It is necessary to conduct the management of international watercourses in an integrated manner and so far, such attempts have gained more and more ground. For example, the management of international watercourses through joint institutions is a common phenomenon and a form of cooperation between the riparian states; it becomes indispensable in attaining equitable utilization and protecting the system of waters.

Therefore, the conflict between the management of fresh water resources and investor rights could be resolved by an integrated approach, which would give priority to the achievement of sustainable development.

Keywords: water management, international investment, sustainable development

378 - IMPACT OF RAINWATER HARVESTING TECHNIQUES ON GROUNDWATER DEPLETION AND CONTAMINATION

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Groundwater abstraction has been multiplied by many folds in the Indian sub-continent since early 70-s. In states like Tamilnadu, Gujarat and Rajasthan, groundwater depletes at an alarming rate of 1 - 5 m/yr. In coastal regions, the groundwater has been contaminated due to reversal in hydraulic gradient. As an age old techniques, though rainwater harvesting attributes in controlling groundwater depletion and contamination, in every case, it is site specific. Hence, Studies were carried out to bring out the impact of the harvesting techniques in different conditions and regions. Hydrogeological studies including aquifer hydrodynamics were used in this study. This study has revealed that though rainfall has substantially reduced in recent decades, the actual reason is attributed to improper management of aquifer system which in turn is attributed to inadequate understanding of the impact of recharge structures on the aquifer system amongst the agriculturists as well as water users. Impact analysis revealed that in shallow aquifers, particularly in weathered portion of hard rock regions has shown increase in the storage capacity of the aquifer by 10 - 15 %. This is well reflected by the dugwells sustaining for longer hours of pumping and aquifers sustaining more than a month than the normal even with rainfall ranging between 400 and 600 mm/yr. In regions affected by saline water intrusion, (coastal regions, wherein limestone forms the aquifer) rainwater harvesting techniques though facilitates additional recharge to the aquifer by 10 - 20% or more depending upon the permeability of the formation, due to very less residence period of recharged rainwater, dilution is insignificant in many cases and hence, these techniques are less effective in improving the groundwater quality. On the contrary, studies have brought out substantial evidence that, additional recharge by harvesting techniques, has been much effective in suppressing the advancement of the seawater intrusion both laterally and vertically. The study carried out thus helps not only in understand the impact of the rainwater harvesting techniques, but also helps in minimising the unnecessary cost involved in implementing rainwater harvesting techniques in near future.

381 - EVALUATION OF THE PRIVATE NATURAL-RESOURCE POTENTIAL FOR SUBAQUATIC LANDSCAPES (ON THE EXAMPLE OF THE NORTHERN CASPIAN SEA REGION)

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The water area of the northern Caspian sea region is subject to the numerous and versatile anthropogenous influences requiring working out of complex protection measures. The important component of nature protection activity is landscape division into districts as within territories homogeneous for natural properties and water areas it is possible to expect the adequate response to any anthropogenous intervention and, accordingly, it is possible to plan the same nature protection actions. One of ways of preservation of subaquatic landscapes (SL) in a stability condition is operation of its resources taking into account natural-resource potential. The urgency of the resource approach to studying subaquatic landscapes of the Northern Caspian sea region is caused by the high social and economic importance of its biological resources, first of all valuable trade kinds of fishes - sturgeon. In 1945, investigating hydro biological resources of the USSR southern seas, academician S.A. Zernov noticed, that the conditions favorable for food fishes, as a rule, are favorable and for all biocenose, therefore in the given work definition of private natural-resource potential subaquatic landscapes of northern Caspian sea region is understood as a set of the natural properties SL defining degree of its suitability for safe existence of population of sturgeon fishes, being on top level of a trophic chain Caspian sea ecosystem. At the first investigation phase sea landscape division into districts of investigated water area has been spent. It is as a result allocated 22 SL a rank of a landscape which concern two areas of the Caspian sea - North Caspian sea area and Middle Caspian sea area (fig.). At a following stage a number of the indicators defining use by sturgeon fishes of water area of investigated region were selected. Frequency of occurrence of Russian sturgeon, Great sturgeon, Ship sturgeon, Persian sturgeon and Stellate sturgeon within each allocated area SL of research (an indicator 1-5) was estimated by results of registration trawling shootings, the quantity of the appropriated points depended on productivity of sweeping (average catch for half an hour sweep). Quantity of the points appropriated subaquatic landscapes for following six indicators (with 6 on 11) specify in presence (1 point) or absence (0 points) within everyone SL migratory ways, summer and winter congestions, areas of distribution of sturgeon fishes during the summer and winter period. By means of 12th indicator use degree was estimated by sturgeon fishes of spawning areas of the large rivers running into Caspian sea. To everyone

mouth areas subaquatic landscapes of the rivers Volga, Ural, Terek and Sulak the certain quantity of points specifying in quantity of kinds of sturgeon fishes, using the given natural complexes for pass on spawning was appropriated. At the third stage, having compared the selected indicators and investigated region subaquatic landscapes scheme, ranging subaquatic landscapes on categories is executed and calculation of private natural-resource potential for each of them is carried out. Calculation of quantity of the points received for each of 22 allocated SL, allowed us to define degree of their development and use by sturgeon fishes on four categories. The first, most numerous group, involved subaquatic landscapes, a little used by sturgeon fishes and possessing low enough (1-5 points) private natural-resource potential. Into this group have entered practically all SL the landscape rank, a part of the North Caspian coastal subarea (except mouth areas of the large rivers SL), the Ural-Emba plain SL which are a part North Caspian near shore subarea, and also a part of SL of a rank of a landscape of Middle

Caspian sea area. Into the second group we have subaquatic landscapes, possessing an average (from 6 to 10 points) private natural-resource potential - mouth areas of the rivers of Terek, Ural, and also abrasion terrace of the North Caucasian foothills. The third group also included three SL, possessing in high enough private natural-resource potential - Volgo-Caspian plain (15 points), Uralskaya deep trench (14 points), and continental slope of the North Caucasian foothills (11 points). In the maximum private natural-resource potential - 20 points - Volga river accumulative deltoid plain subaquatic landscape is possess.

The technique of an estimation of private natural-resource potential of subaquatic landscapes northern region of Caspian sea on icthyological indicators is developed. Results of an estimation of private natural-resource potential of subaquatic landscapes and resource forming factors of investigated region have allowed to spend ranging allocated SL on four categories depending on degree of use of resources of each of them sturgeon fishes. It is received, that each of 22 areas resource forming of research possesses the certain private natural-resource potential, the carried out calculations have allowed to group subaquatic landscapes on four categories depending on degree of use of resources of everyone sturgeon fishes. It is received, that optimum conditions for stable existence of sturgeon fishes have remained in mouth areas of the rivers. The offered method probably to apply at planning of nature protection activity.

Keywords: subaquatic landscape, Caspian sea, natural-resource potential.

TOPIC 5

WATER BODIES PROTECTION AND ECOHYDROLOGY

001 - INTERNAL METAL DISTRIBUTION IN SEDIMENT - PORE WATER – WATER SYSTEM OF SOME BIGHTS AT NASSER LAKE, EGYPT

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A fate and bioavailability of pollutant metals is important to the long - term health of freshwater. The main objective of this study aimed to follow up the distribution of some heavy and major metals (Fe, Mn, Zn, Pb, Cd, Co, Ni, Cr, Cu, Ca, Mg, Na and K) between sediment - pore water - water system of some bights of Nasser Lake. Sediment and water (surface and bottom) samples were collected from the beginning and the end of three bights at Nasser Lake, Egypt. All studies metals were measured using atomic absorption technique except Na & K were analyzed by atomic emission spectrophotometry. Water quality variables were monitored at surface and bottom water. Chemical partitioning patterns of metal show decrease in concentrations of measured metals in sediment (in exchangeable fraction), reflect the decrease of pore water contents, wherefore the water body characterize by low metal concentrations.

The alkaline pH-values of water bights minimize the reflux of metal ions from lake sediment and increase of metals sedimentation rate. The application of Pearson correlation approaches for the interpretation of large data matrix obtained was performed using SPPS statistical package program. Positive correlations were arise between different metals in pore waters and lake water suggesting.that, sediment upper layer served as a metals reservoir from water, but not as an ultimate mechanism to control metal concentrations in the adjacent water. Also these correlations between components give chance to follow the distribution of measured metals between sediment - pore water - water lake system.

Keywords: Sediment - Pore water - Water system - Internal metal distribution - Heavy metal - bioavailability - Nasser Lake

002 - PRESENCE OF NITROGEN CYCLE BACTERIA IN THE WATER OF STREZEVO RESERVOIR

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Strezevo reservoir is important source of water supply for public utilities, agriculture and industry. An excessive inflow of biogenic elements coused by agricultural and domestic effluents is the main cause of deterioration of water quality of the reservoir, which reflects on the composition and the number of bacterial communities. Aim of this investigation was to determine seasonal and vertical changes in the number of nitrogen cycle bacteria (ammonifying, nitrifying, and denitrifying bacteria) in the water of Strezevo reservoir during the period of one year. Denitrifying bacteria dominated in 55.55% of water samples.

Nitrogen cycle bacteria were found more numerous in depth of 5m of the reservoir, in different investigative periods. This stays in relationship with existing physicochemical conditions of water, for example: temperature, pH value, oxygen contents, organic and mineral compound of nitrogen contents. Seasonal changes showed maximum in early summer and late autmn, when concentrations of organic matter were higher.

Keywords: Strezevo reservoir, nitrogen cycle bacteria

006 - DETERMINATION OF GROUNDWATER - SURFACE WATER RELATION BY USING ENVIRONMENTAL ISOTOPES AT SULTANSAZLI-I WETLAND-TURKEY

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Sultansazli-i Wetland is placed in Develi Closed Basin in Turkey and it is one of the seven important wetlands of Turkey and the second important bird habitat of Turkey. Sultansazli-i Wetland is also known as one of the most important wetlands of the Eastern Europe and the Middle East. There are Yay Lake, Çöl Lake, North and South reedfield areas in Sultansazligi Wetland Region. This wetland area is a conservation area protected by International Ramsar Agreement. Water level of Sultansazli-i Wetland had been decreased in the recent years and also there is an irrigation water supply problem in Develi Closed Basin. There are many illegally opened wells in Develi Closed Basin. In order to find out the effects of water scarcity in Sultansazli-i Wetland, environmental isotopes are used to determine surface water of wetland and groundwater intrusion. In this study tritium (H3), deuterium (H2), oxygen18 (O18) are used as environmental isotopes. Total 44 bottles of water samples had been taken from the groundwater (from springs and wells) and surface water of Sultansazli-i Wetland (from E-ri and Sap Lake) during 2003-2005 time period. Oxygen 18, Deuterium and Tritium analysis of these water samples had been made at the isotope laboratory of State of Hydraulic Works (DSI). According to the isotope analysis, it is found out that there is no direct relationship between the surface water of Sultansazli-i Wetland and groundwater under the wetland.

Keywords: Isotope hydrology, surface water-groundwater interaction, Sultansazli-i Wetland

007 - STUDY OF THE FLUCTUATIONS OF SUBSOIL WATERS OF THE PLAIN OF GHRISS MASCARA - ALGERIA

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The plain of Ghriss covers vast wide of a surface of approximately 1185 km². It is located in the wilaya of Mascara with an average altitude of 585.03 m. With a semi-arid climate and a recurring secheress, this area recorded only one mean annual rain of 257.81 mm between 1994 and 2004 whereas it was located between isohyets 400 and 500 mm. The plain of Ghriss is an area with agricultural vocation with a truck farming dominating. The mean level of water of the wells or drillings in this plain is estimated at 70 m and several wells of observations of the piezometric network are dry.

The volume of water extracted is estimated at 88 hm³/year whereas the contribution of the tablecloths is not that 66 hm³/year is a deficit of 32 hm³/year. This plain suffers from an overexploitation due to husbandry and the demographic growth through the AEP. By hoping for a fast return of the favorable weather conditions, a policy of management of water is inevitable to save this plain which is richest of the oranie from the agricultural point of view.

Keywords: Subsoil waters - Deficit - Overexploitation - Plain of Ghriss - Algeria

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011 - SALINITY PROBLEMS IN NORTHERN CYPRUS AND ALTERNATIVE FORMULATIONS

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Northern Cyprus lives water scarcity problems and it is expected to increase in future due to the reduction in rainfall owing to the climate change.

In Northern Cyprus, the annual water consumption is about 100 MCM, in which the share of the agricultural water is 70% whereas domestic water consumption is 30%. The small industry in the country is supplying water from the municipal networks. Despite the water limitation in the country, the water consumption is 250 l/day/capita, in which, the share of the householders, industry and water trade is 80%, 12% and 8% respectively. The water in the country is mainly supplied from the groundwater resources (95%), dams, ephemeral springs, desalination plants and transported water.

Poor water management has impacts on aquifers of the region, which end up with salinization problems due to the seawater intrusion. In this study, salinity problems in Northern Cyprus are mentioned and alternative formulations have been suggested. The following solutions are discussed:

i. Transporting water by tanker from Turkey to Northern Cyprus,

ii. Transporting water by pipeline from Turkey to Northern Cyprus,

iii. Desalination

iv. Irrigation development

v. Wastewater reuse

Keywords: desalination, water scarcity, alternative water resources

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017 - THE IMPACT OF UNCOMMONLY EVENTS UNDER "CUIBUL VULTURILOR" RESERVOIR FROM TUTOVA WATERSHED

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For rural and urban community, placed in hill area, the reservoir represents an important local source of water and in the same time these reservoirs offer a high contribution at regularization of runoff and to decrease the high floods. The problem of soil erosion, sedimentation and water quality degradation of dam storage placed in hill area is ominously in our country. Soil erosion has a great impact on reservoirs, owing to sedimentation and the degradation of water quality.

When there are interest to protect the reservoirs, it must to accord interest "sediments process's" and "sediments storage's" who in the "sediments system" it must be distinctly regarding but, in time and space scale very well defined, and in connections. Another problem who must be considered is the impact of the uncommonly events like fast snowmelt, torrential rainfall and long term rains under these reservoir.

Concerning fertilizer it must be interested in their influence on water quality. The sediments sources analyze must be regarding tow aspects: provide area reported at watershed or the land use and the generating process, concerning fertilizer these must be regarding also tow aspect quantity of the inputs and the effect of water quality.

In the light of presented problems the study of uncommonly events impact under these reservoirs is a strong necessity because these events increase the gravity of erosion phenomenon who through their consequences guide to degradation of these reservoirs, physical degradation - sedimentation, and chemical degradation - degradation of water quality. It was establish the excessive influence area looking the impact of erosion processes of Cuibul Vulturilor reservoir. In these area it was make erosion and sediments effluence determinations who, at least it was analyzed in complex with the rate and mode of reservoir sedimentation's.

Cuibul Vulturilor reservoir, taken into exploitation in 1978, placed in the lower watershed of Tutova river from Tutova Hills who are placed in the south-west of Moldavian Tableland, assure a great part from the drink water for population of Barlad town (about 70 thousandth inhabitants). Water retention is realized from an earth dam (17 meters height and 843 meters length at dam crest) with a central weir and a laterally spillway on the right bank. The initial study (made forward 1978) regarding the sedimentation of this reservoir show as that the affluent flow (in the Tutova control section of the Tutova river - annual mean value) is - 0.86 m^3 per seconds: the alluvial discharge is 0.6 kg per seconds (19.000 to/year) - which corresponds to a specific rate of 0.28 to per hectare and year. The same study shows that there are two possible sediment deposit area at 3 - 5 km and 7 - 9 km from the dam, who thickness after 50 years could reaches an average value of 1 to 1.5 m's.

According to annual real mean sedimentation ratio in this reservoir yearly enter about 221.430 m^3 sediments but from the area located in the vicinity of the reservoir enter, only when are happened uncommonly events, about 98.755 m^3 sediments that mean 65 percent from all sediments step in the reservoir in one year. From these volume of sediments that provide from the area located in vicinity of the reservoir 13.1 percent provide from the hill slopes and 86.9 percent provide from the watersheds. This value show that the contribution of the watersheds located in vicinity of reservoir direct overflow in the reservoir is the most important quantitative in comparative with the hill slopes and show us that the uncommonly events have a great impact on sedimentation's reservoir through great sediment effluence in compare with annual mean sediment effluence who are take currently

in estimation of sedimentation reservoir in designing process of them.

Concerning fertilizer about 70% from these come in reservoir at fast snowmelt (69% N mineral and P_2O_5 respectively 72% K_2O) because that the sheet erosion was predominate, through difference of long term rainfall when although sediment effluence was bigger, predominate was gully erosion who involve, in principal, eroded material from bank and bottom of gully who are little rich in fertilizer.

The most consistent contribution in fertilizer where assured, like in the case of sediment effluence, by the watersheds located in vicinity of reservoir direct overflow in the reservoir between 81% and 91% in function of fertilizer element.

For a good protection of reservoir priority is equipping and ant erosion exploitation of land placed in the vicinity of permanent water surface that in general represent about 10% from watershed who supply the reservoir from hill area.

Keywords: erosion, sediments, effluence, fertilizer, water quality.

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026 - THE POSSIBILITY FOR COMPLETE WASTE WATER PURIFICATION

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It is known that the waste water from the factories for the nitrocellulose production contains sulphuric acid which is usually neutralized with lime giving the nitrogypsum ($CaSO_4 \cdot 2H_2O$) as the by-product.On that manner the problem of this waste water is only partialy solved because the nitrogypsum is dumped near the factory and exist as ecological problem.

In this paper the method for nitrogypsum dehydration with the purpose of useful product -hemihydrate of calcium sulphate ($CaSO_4 \cdot 0.5H_2O$) obtaining, was applied.This method is consisting of suspending the gypsum in aqueous solution of sulphuric acid with the different gypsum/acid solution mixing ratios, under pat. After predetermined time the phases were separated by vacuum filtration, and the products were washed with boiled water,dried and investigated with DT,IR and microscopic analysis.

Obtained results indicates α-hemihydrate of calcium sulphate ($CaSO_4 \cdot 0.5H_2O$) formation for allsuspensions of gypsum in acid solution (20% mass.) with the

slurry density below 0.6 g/cm^3 .For the suspension with the higher slurry density dehydration reaction did not go to completion.It means that by the usage of this method the problem of the reutilization of obtained by-product and also of the waste water, can be finally solved.

Our further investigations would include laboratoric and pilot-plant experiments in which the part of this waste water (which contains sulphuric acid) from the nitrocellulose production, would be used with this aim.It seem that it would be the most suitable and economic procedure for this waste water complete purification.

Keywords: nitrogypsum, hemihydrate of calcium sulphate, α-hemihydrate of calcium sulphate.

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028 - PESTICIDES CONCENTRATION AND SOME QUALITY PARAMETERS OF SURFACE AND UBDERGROUND WATER IN SPECIALLY PROTECTED AREA OF SALT LAKE, TURKEY

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Specially Protected Area of Salt Lake is of about 7414 km^2 which is located geographically in latitude 39° 30' 00" to 38° 00' 00" and longitude 32° 30' 00" to 34° 30' 00" in Central Anatolia. Wastewater reaches the Salt Lake through 150 km long Konya main drain channel and the other small creeks. Brackish marshes have formed where channels and streams enter the Lake. Rainfall in the surrounding area is as low as 250 mm per year, average temperature and annually total evaporation are 11.8°C and 1372.7 mm, respectively. The lake is surrounded by cereal fields in the north, east and west. The Salt Lake also includes a unique ecosystem with its natural attractive environments and habitats for biota.

Pesticides have been commonly used for cereals to protect from subsoil pests. In order to determine pesticide pollution in the Specially Protected Area of Salt Lake, 30 total set of water samples (15 surface and 15 underground samples) were collected from the study area. Four pesticides due to their extensive usage were

analyzed. These pesticides are Chlorpyriphos, Chlorpyriphos-methyl, Atrazine and Simazine. Pesticide concentrations of surface waters varied from 0,00018 to 1,5 mg Simazine L^{-1}, negligible to 0,35 mg Atrazine L^{-1}, negligible to 0,062 mg Methyl-Chlorpyrifos L-1 and negligible to 0,062 mg Chlorpyrifos L^{-1}. Simazine, Atrazine, Methyl-Chlorpyrifos and Chlorpyrifos were around 0,40 mg L^{-1} 0,063 mg L^{-1}, 0,05 mg L^{-1} and 0,08 mg L^{-1} in underground water, respectively. Some water quality parameters such as pH, salinity, sodium absorption ratio (SAR), anions and cations were also analyzed.

Keywords: Water, pesticide, surface, underground, Salt lake

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030 - DYNAMICS IN SURFACE WATER QUALITY; UNDERSTANDING OF SHORT SCALE NATURAL VARIABILITY IN SURFACE WATER QUALITY IN ORDER TO IMPROVE TREND DETECTION FROM REGIONAL MONITORING DATA

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Pollution of surface waters in densely populated areas with intensive land use like the Netherlands, is a serious threat to their ecological, industrial and recreational functions. The Dutch National Manure Policy and several regional and local pilot projects aim at reducing pollution loads to surface waters. For the evaluation of the token measures, water authorities and environmental research institutes are putting a lot of effort into the monitoring of the surface water quality. The measurement locations in these regional surface water quality monitoring networks are usually situated in the downstream part of the catchment to represent a larger area. The monitoring frequency is usually once every month. The variability in the measured concentrations is only partly understood.

Human induced trends are usually concealed by the large variability of surface water quality caused by meteorological variations. This study aims at improving understanding and prediction of temporal variability in surface water quality and at improving detection of human induced trends by correcting for natural temporal

variations. Continuous surface water quality measurements were performed both on the parcel scale and the catchment scale. These continuous water quality measurements were related to measurements of precipitation excess, surface water discharge, groundwater heads, groundwater quality, tile drainage flux and tile drainage water quality.

Keywords: Surface water quality, trend detection, monitoring

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031 - RECYCLING OF POWER PLANTS WASTES - POTENTIAL WATER POLLUTANTS

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Fly ash and bottom ash are major by-products of the coal combustion process in thermal power plants. They are composed of oxides of Si, Al, Fe, Ca, Mg, Na and K. Along with oxides, fly ash and bottom ash contain trace elements (Sb, As, F, Cr, Cu, Co, Ni, Zn, Cd, Mn, Pb, Hg, V etc.) which represent the potential water pollutants. Usually, fly ash and bottom ash are disposed off using the wet method (slurry form) into disposal sites. Consequently, potential ground water and surface water contamination by the toxic elements - ions from the ash disposal sites is predictable.

A combination of suitable disposal technique and increased utilization is required to combat the environmental problem associated with coal ashes generation.

Solidification/stabilization (S/S) is a widely used technique for disposal of wastes which inhibits the migration of waste ions into the surrounding environment.

Now a day, the utilization of coal ashes in road construction is very interest, because this utilization ensures consumption of fly ash and bottom ash in bulk.

The possibilities of recycling of fly ash and bottom ash from the "Nicola Tesla" power plant (Serbia) for road construction were investigated in this study. The results showed that three mixtures could be utilized as sub-base mixtures for road construction:

1. 34.18% bottom ash: 25.64% fly ash: 8.55% Portland cement: 31.63% water,
2. 34.18% bottom ash: 27.34% fly ash: 6,85% Portland cement: 31.63% water and

3. 41.14% bottom ash: 20.57% fly ash: 6.85% Portland cement: 31.44% water.

The compressive strength values of these mixtures after 7 days of hardening (1.62 MPa, 1.57 and 1.61 MPa, respectively) were higher than the low limitation (1.5 MPa) recommended by JUS (Yugoslav Standard) for sub-base mixtures.

On the basis of X-ray diffraction analysis (XRD), differential thermal analysis (DTA) and thermogravimetric analysis (TGA) of mentioned hardened mixtures it was evident that the products of hydration reactions: ettringite ($3CaO•3CaSO_4.Al_2O_3•32H_2O$) and hydrated calcium silicates (C-S-H) were formed. Their formation is important because of their possibility to immobilize the trace elements and to minimize the adverse environmental impact of recycled materials in road construction.

The combination of cementitious properities (compressive strengths) and the potential for immobilization of hazardous trace elements could result in utilization of mentioned three mixtures in road construction. However, long-term examinations are necessary.

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033 - BIOGEOCHEMISTRY OF ARSENIC IN SHALLOW AND DEEP AQUIFERS OF BENGAL DELTA PLAIN: A STUDY OF THE ARSENIC EXPOSURE AND MITIGATION OPTION

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Recent incidences of high arsenic exposure from drinking water and human suffering in SE Asia notably in Bengal Delta Plain (BDP, Bangladesh and adjoining parts of Eastern India) appear to be quite different from that of the global scenario. The study deals with groundwater quality and hydrogeochemistry in arsenic affected areas of BDP and demonstrates that there is a clear difference in deep and shallow groundwater quality as well as hydrochemistry particularly in terms of arsenic concentrations.

The extent of arsenic contamination is not well defined, however, is believed to cover large parts of the BDP and is now spreading to the adjacent virgin deltaic plains. The spatial variability is considerable over both the vertical and horizontal

profiles. The investigation suggests that geochemistry of the arsenic affected shallow aquifers are nearly alike and scale is largely depends on the local redox signatures.

The groundwaters hydrochemistry show that the dissolved arsenic spans over four order of magnitude (< 3- 1059 mg/l) with varying concentrations of As (III)/(V) and the concentration of associate redox elements (Fe and Mn) are also relatively high (FeT- 28- 10252 mg/l and MnT- 62- 4739 mg/l).The concentrations of dissolved Al is also relatively high with a range of 16- 1077 mg/l. These focus the BDP sediment host environment that contents considerable amount of arsenic carries/ traps (Fe / Mn /Al). On the other hand, alkaline earth elements (Ca2+/Mg2+/Sr2+/ Ba2+) are also significantly present (Ca- 23 - 277 mg/l, Mg- 14- 69mg/l, Sr-78--1015mg/l, Ba- 31-529mg/l) since their concentrations in groundwater are often controlled by carbonate minerals. These elements are quite variable in shallow and deep aquifers of BDP and reflecting the free distribution of simple and mixed carbonates in the aquifers sediments from where the water has been pumped during the extensive sediment-water interaction (older sediments at deep/deeper depths rather than recent deposited). The relatively high presence of alkali metals (Na+ - 14- 467 mg/l , K+- 3- 9.2 mg/l) in Baruipur shallow/deep groundwaters also indicate that the groundwater reflects relict seawater influences either by marine inundation of low-lying areas and/or saline intrusion , however , the large scale groundwater development (local pumping) is very limited in agriculture and municipal purposes. Groundwater pHs are circumferential neutral to slightly alkaline (6.4-8.1) with moderate (Chakdaha - Shallow ~ av. 692 mS/cm, deep~ 512 mS/cm) to high (Baruipur- Shallow~ 1028 mS/cm , deep~ 2083 mS/cm) conductivity. The major anion is HCO3- (range- 160- 740 mg/l) followed by chloride (range- 6- 538 mg/l) and PO43- (range- 0.11-8.0 mg/l) where as NO3- (> 1 mg/l) and SO42- (range- 0 - 9.6 mg/l) are relatively low to very low where D.O is generally absent.

The water quality reveals that the groundwaters are in general D.O and SO42- deficient and Ca-Mg-HCO3- type. Groundwaters of shallow aquifers (5-70 m) are often enriched with DOC (range- 1.2- 7.0 mg/l) where as deep aquifers (100-304 m) are relatively containing low amount of DOC (0.4- 1.9 mg/l). This reflects the influence of local processes at shallow depths where oxidative as well as microbial degeneration of carbon is frequently observed. This also suggests that the break down of organic matter is the principal process in the shallow reducing aquifers with high/low arsenic along with high/low redox sensitive species and DOC.

The presence of DOC in shallow aquifers also indicates that organic matter is relatively young and more reactive. High pCO2 values, relatively high redox sensitive elements, low Eh and absence of D.O are the hydrogeochemical fingerprints of the BDP shallow aquifers. On the contrary, deeper aquifers of Chakdaha are arsenic bearing with low concentration of chloride where as deeper aquifers of Baruipur are saline with or without low arsenic. Both the deeper aquifers

are also containing high bicarbonate. This indicates that mineral carbonates (both simple and complex) are also playing important role in arsenic mobilization at least in deeper aquifers. The study also deals with the role of secondary minerals (mica/clay) in arsenic mobilization. The XPS studies on mica further strengthen that the surface chemistry and role of Fe (II) [a strong reductant] are also important issue to understand the difference of high/low arsenic in between shallow and deep aquifers in BDP. The paper also deals with various mitigation options (short/ medium/long term) that have been considered for alternative water supply. On-side evaluations of the technologies are made. The strength and weakness of the on-going drinking water supply programme and their achievability are also evaluated. The paper also advocates a holistic approach (MCA- Multi Criteria Approach - a decision making tool) for water resource assessment, management and protection and addressing a link between practice, science and policy in the search for sustainable solutions for water resource management.

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037 - TERRACE MINERAL AGGREGATES EXPLOITATION IMPACT ESTIMATION ON PHREATIC GROUNDWATER CATCHMENTS. CASE STUDY : CORNESTI AREA, CLUJ COUNTRY, ROMANIA

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The intensification of the activity in the construction field determined an increase in the necessary of mineral aggregates. If until not long ago they were exploited mainly from the courses of the rivers, currently there is a tendency of exploiting towards their flood plains and terraces.

In the Cornesti locality area, Cluj County, there is an alignment of wells which exploit phreatic groundwater from the terrace of the right bank of the Aries River.

This work presents, based on the analysis of the local geological and hydrogeological conditions, the estimation of the impact occurred through a future exploitation of mineral aggregates from this terrace, in a perimeter situated upstream the catchment front and the Cornesti locality.

The estimation was made from the quantitative and qualitative point of view, for the situations in which the exploitation will be made above or under the hydrostatic level of the phreatic aquifer.

In both situations it is considered that the quantitative impact, respectively the decrease of the hydrostatic level of the phreatic aquifer due to the intensifying of the evaporation phenomenon is not significant.

From the qualitative point of view, the highest vulnerability degree to pollution of the phreatic aquifer, and implicitly the fountains from Cornesti and certain wells from the catchment front appears in the case of the mineral aggregate exploitation under the hydrostatic level of the aquifer.

Keywords: mineral aggregates, phreatic aquifer, quantitative impact, qualitative impact.

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044 - FACTORS INFLUENCING CONSUMPTION OF WATER FROM DIFFERENT SOURCES IN DIFFERENT SWINE EXPLOITED INTENSIVELY

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For well-balanced feed ratios and in conditions of good thermal neutrality, consumption of water from underground water sources has values between 1.0-1.5 l/kg of dry matter if it meets minimal potability conditions. When surface water sources are used, particularly during hot weather when water temperature reaches 150 °C, water consumption reaches 2.5-3.2 l/kg of dry matter in suckling piglets or 4.0-6.0 l/kg in fattening pigs. No matter the water source, water consumption decreases with weight gain and with live weight. No matter the weight category, the physiological state, and the administration way, the quality of water from different sources has the highest impact on water consumption per kilogram, with important effects on the economic efficiency of increase and on the animal species.

Keywords: water consumption, sources, water quality, weight categories, swine

047 - DYNAMIC OF THE EUTROPHICATION PROCESSES IN DURANKULAK WETLAND SYSTEM, NORTHEASTERN BULGARIA

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Durankulak wetland system is situated in Northeastern Bulgaria near Black sea. The wetland system is a part of the Black sea catchments. Its water balance is connected with fluctuation in the level of karst waters. The other factor is water flow from the two rivers with irregular regime in the southwestern, west and northwestern part of the lake - Vaklinska, Korudere and Granicharska. The general factor is the karst waters in the region of the lake. The artificial channel between Black sea and the lake has no real function in the present dynamic of the processes in the wetland system. It is situated in the eastern part of the wetland.

The region is popular with unique landscape diversity. The lake is important area for the waterfowl bird, especially during the autumn-winter period. The object is protected from the Ramsar convention and Bulgarian law.

The general problem for the wetland system is the eutrophication in the last ten years. It is a basic process in the transformation of the ecological state of the wetlands. Eutrophication is connected with changes of the water body, expansion of the plant species and saturation of the waters with biogenic elements. The change of some parameters can reflect in negative aspect to the wetlands and the production of the species in the wetlands.

Keywords: wetland; eutrophication, organic materials

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051 - RESERVOIR DE-SILTATION AND RAPID MUD DEPOSITION IN A RIVER – RISK TO AQUATIC ECOSYSTEM HEALTH AND HUMAN USES

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The water in the lower reaches of Kerala's (South India) largest river Periyar (Cochin backwater system) had rapidly changed to red. The discoloration and

turbidity were due to the unprecedented action of empting a major reservoir with the running down of the mud and silt collected in the reservoir during the last 18 years. It had flushed down tones of decomposed bio-waste and sediments into the river and the river water got discolored with its taste and smell changed. More critically, the sediments got into several rural water supply pumping systems in the downstream. Pumping of the muddy water and distributing the same employing the traditional treatment methods using chlorine and alum seemed to be insufficient for human consumption due to the presence of high impurities and discoloration. Though the present crisis occurred only on account of the negligence on the part of the officials supposed to clean the reservoir once in two years, but such cleaning was never done in the last 18 years resulting in accumulation of sludge, similar openings of the dam shutters can occur due to the heavy precipitations associated with climate changes. It is worthy to examine the water quality changes in the river and the manner in which the 40 lakh people depending on this river for potable water reacted to the alarming situations of the spreading of waterborne diseases and also to look into the urgent precautionary measures taken by the authorities. The turbidity level in the river had varied between 58 and 68 ntu. After treatment with alum and lime, the water quality level reached to the acceptable limits between 4 and 7 ntu. The turbidity was 1 ntu before the problem began. With the pollution in the river crossing all limits, local NGOs after waiting in vain for some help to come by from the authorities concerned had to approach the judiciary to order the release of enough fresh water from another dam to remove the muddy water in the river and also seeking a direction to the government to constitute a high-power monitoring committee to take appropriate action and release sufficient funds to meet the situation and for initiating action against the officials for their failure to carry out periodic cleaning of the dam. Growing public discontent over the muddy waters issue had forced the Government to take steps to ensure the quality of drinking water by the release of clean water from two other dams to check the increasing levels of turbidity. One anticipated after-effect of the inflow of silt and decomposed organic matter seems to be "eutrophication". To pre-empt eutrophication, the authorities need to step up inflow and stabilize the pH factor and oxygen content in the river. To increase inflow into the river, the authorities have decided to divert water from another reservoir into the river. It is high time for the government authorities to think about the mitigation plans to deal with dam shutter openings in the event of flooding and heavier monsoons envisaged with ongoing global warming.

Keywords: Mud deposition, reservoir de-silting, turbidity changes, eutrophication

052 - PLEISTOCENE CONFINED AQUIFER IN THE SOUTH-WESTERN PART OF BRASOV DEPRESSION, ROMANIA

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Brasov Depression is situated in the central-eastern part of Romania and represents an intracarpathic depression. Geomorphologically, it distinguishes three relief major types: the montane frame, the piedmont and the alluvial plain. On the last type it observes left branches and telmatic areas.

Geollogically, in the study area there were separated the following lithostratigraphical entities: the Coaly Formation (ascribed to the Dacian-the first part of Early Romanian interval), the Marly Formation (the upper part of Early Romanian), the Iar-Sands (the lower part of Middle Romanian), the Andesitic Volcano-Sedimentary Formation (the upper part of Middle Romanian-the first part of Early Pleistocene), the Sandy-Clayey Formation (the upper part of Early Pleistocene), the Formation of Sands, Gravels and Clays (Middle Pleistocene), the Formation of Gravels (Late Pleistocene-Holocene) and Holocene deposits. Noteworthy that in the Brasov Depression (the central and north part) there were discovered some mammal faunas which permit both a detailed chronostratigraphical division of the deposits and the possibility of correlation with the clasical mammal deposits in Eurasia.

Structurally, the Brasov Depression was generated by a subsidence which it happened in a long interval, from Dacian (possibly even Pontian) until Holocene. The Dacian-Early Pleistocene deposits are affected by longitudinal faults, generally oriented north-southward, and transverse faults, generally oriented west-eastward.

Hydrogeologically, the study of data resulted from wells drilled in order to investigate the groundwaters from this region have emphasized a confined aquifer located in Pleistocene deposits and a phreatic aquifer widespread in depresssion. The Pleistocene deposits are represented by clays, silts, sands, gravels and boulders. These rocks hint changes of the aquifer dynamic regime during the Pleistocene when there was a fluvial-lacustrine sedimentation environment characteristic to the most part of the Brasov Depression. In the Pleistocene period, the colder climatical variations have intensified the erosion processes and some paleowatercourses come from orogen area have generated small channels and alluvial fans with the above mentioned coarse deposits (sands, gravels, boulders).

As concerns the hydrogeological characteristics of Pleistocene confined aquifer there were taken into account the test pumpings in hydrogeological wells. Thus,

the yields of the wells vary between 3 l/s at Brasov (for 4.5 m drawndown) and 10 l/s at H-rman (for 1 m drawdown). The depths of piezometric levels are comprises between 0.6 m (Satu Nou well) and 34 m (Râsnov well). The thickness of collecting layers ranges from 1.5 m to 18 m and the hydraulic conductivity between 8 m/day (Râsnov well) and 21.6 m/day (Satu Nou well). Broadly, the groundwaters present ascensional level; sometime, they can also present artesian level. The recharge of confined aquifer is achieved through the precipitations and surface waters infiltration which is more intens to the layers extremities in the orogen-piemont contact area.

Keywords: Brasov Depression (southwestern part), Pliocene-Quaternary deposits, lithobiostratigraphy, tectonics, Pleistocene confined aquifer.

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060 - PRELEMINARY DATA ON USING INSECTS AND OTHER INVERTEBRATE GROUPS AS BIOLOGICAL INDICATORS OF WATER QUALITY IN SOME ALBANIAN RIVERS

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Aquatic macroinvertebrates are good indicators of biodiversity andhabitat quality (Lee N. 2003). These insects inhabitat aquatic ecosystems for most of all their lives and are sensitive to different chemical and physical conditions (Water and rivers Commission 1996) their survival is clossely linked with envinronmental conditions.

Therefore their presence is an important indicator of watershed health (Conserving Biodiversity in Greater. Vancouver. Indicator species and Habitat Quality April 2003).

During last years different studies and datas are collected on Albanian rivers water quality. Our stady aime to give a preeleminary situation of Albanian rivers water quality based on the data gathered on insect and invertebrate fauna.

In our study EPT (Bode and al. 1996) and TV. (Reis M. 2000) was evaluated for the rivers of Buna, Shkumbini and Vjosa (north center and south Albania). The results show that ETP was 20 and TV 5.7 for Buna river and for Vjosa river ETP was 13 and TV 6.2 (preleminary data) (Data on Shkumbini river on Processing study). Based on this preeleminary data we can say that the water quality of those rivers is still very good.

Keywords: ETP, TV, water quality

063 - CHLOROPHYLL AS BIOMASS INDICATOR IN BOKA KOTORSKA BAY

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In the period from September 2003 to August 2004, nutrients and chlorophyll a concentration, as eutrophication indicators were analysed at five sampling stations in Boka Kotorska Bay. The analyzed parameters varied considerably during the study period. The maximum value of phytoplankton biomass as represented by chlorophyll a occurred in December and ranged from 5 mg/m^3 to 6,5 mg/m^3. According to criteria UNEP (1994) as well as H-kanson (1994) that are some stricter, this area could be classified as mesotrophic except in December when it is eutrophic. It seems that heavy rains contribute to the increased content of nutrients in the Bay during winter and consequently to higher phytoplankton activity.

Keywords: Chlorophyll a, nutrients, eutrophication, Adriatic Sea

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070 - POLIMER FACING MATERIALS.

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Water is one of the most important natural resources on earth, playing an irrevocable role in the economical and social development. The matchless nature of the problem called "Natural Water Source" is derived from the characteristic instability of the main hydrodynamic parameters, which are unpredictable with respect to certain extreme situations or for the future. That is why the policy of management of water resources is not static in fact, but dynamically bound by a concrete situation: geographical region, with the respective hydro-geologic characteristics, climatic factors, socio-economical management parameters, stage of scientific, technical and technological development.

Water-resource-management policy is an expensive and responsible activity.

Upon a detailed and professional hydro-ecological monitoring, efficient water-management may be achieved by durable, and sometimes significant investments in the development of new water-proofing materials and technologies and standard hydraulic engineering whose operational parameters have been optimized with respect to the strict standardization of water-pumping and use, to cover a specific project task. This limits to the highest degree the possible losses of "useful water", guaranteeing the efficiency of the hydraulic works during its operational period.

A new technological solution concerning the application of polymer puttying compositions having mechanical, chemical and other important ecological merits, applicable to irrigated farming.

Keywords: Irrigated Farming, polymer puttying composition, water-resource economical-ecology-management.

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071 - INVESTIGATION ON EXPLOITATION STABILITY OF HYDRO-TECHNICAL CONCRETS WITH POLYMER COMPOSITE CONCRETE POLYMERS

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When examining concretes as porous bodies there arises the question of the role and degree of effect by some agents, specifically for the irrigation engineering practice, of water in direct contact. The water filtering through the concrete results in the appearance of several unfavorable effects on the concrete facing; on one side it reduces the strength and deformation characteristics of the concrete monolith, and on the other it creates physical corrosion, aggressive at low temperatures and chemical at ordinary and elevated temperatures. As a result of this different strains in type and degree originate resulting to the failure of the concrete facing.

In a model experiment it was established that the addition of water-soluble thermo-reactive resin containing epoxy and phenol-formaldehyde composite to the concrete mixture improves its frost and corrosion resistance; decreases water absorption and permeability, which results in increasing the exploitation durability of the hydro- equipments constructed with the purposes and for the conditions of the irrigation agriculture.

Keywords: Irrigation engineering farm-practice, polymer composite

072 - ANALYSIS OF BIOLOGICAL WATER QUALITY PARAMETERS OF THE RIVER NISAVA UPSTREAM OF WATER TREATMENT PLANT "MEDIANA"

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The water treatment plant "Mediana", which is located on the bank of the Nisava river, is very important for water supply of the city of Nis. In the maximum water consumption season, this source produces over 60% of water for the city. In order to test the physico-chemical water quality parameters, the Nisava river water samples upstream of the water treatment plant "Mediana" are taken. The analysis of the obtained results indicates that a majority of samples of almost all the physico-chemical water quality parameters falls within the acceptable range.

However, the systematic investigation of the biological parameters of the Nisava water quality upstream of the water treatment plant "Mediana" has not been performed. This paper presents the results of hydrobiologic research of the Nisava river of 2005. The goal of the research was to determine the status and quality of water as well as of the periphyton, macrozoobenthos and ichtyofauna communitites.

The paper is divided into the following units. After the introduction, the second chapter presents the water treatment plant "Mediana". A short analysis of the physical-chemical water quality parameter is given in the third chapter. The fourth chapter considers the materials and methods employed in this research. The results and the discussion have been presented in the fifth chapter. The Conclusions conclude the paper.

Keywords: Water Quality, Periphyton, Macrozoobenthos, Ichtyofauna, River Nisava

079 - MONITORING GROUNDWATER QUALITY IN THE VELIKA MORAVA ALLUVIUM, STATUS AND REQUIREMENTS

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Resources of quality water in the Republic of Serbia are relatively moderate. Protection and maintenance of all water resources are important with regard for the increasing demands of the modern society. One of major resources is in the shallow unconfined aquifer in the Velika Morava alluvium. This source is utilized for public water supply to urban quarters, industries, agriculture for seasonal irrigation, individual rural users, etc. The Velika Morava alluvium, thick between six and twenty metres, is a hydrogeological unit of regional importance for the quantity and quality of contained water. Groundwater is unconfined in the material deposited by the river in a length of about 120 km and width from 1 km to 20 km.

The existing monitoring system of groundwater quality consists of only twelve observation wells. Four groundwater bodies are designated for initial characterization. The designation criteria were geological, hydrogeological, geomorphological and the identified impacts (pumping, contamination, artificial recharge, sources of pollution, and the like). Each of the four groundwater bodies is described and its prospective utilization interpreted as a regional water resource. With the growing pollution hazard, however, monitoring of groundwater quality in this resource is essential for its maintenance and sustainable utilization. Locations of observation wells for groundwater quality monitoring are proposed. The recommended observation network will be designed on the Conceptual Model, or understanding of natural characteristics and the information of actual impacts in compliance with the Water Guideline Framework.

Keywords: alluvium, groundwater quality, pressures, observation network, water supply.

081 - SHORT LIVED RADON PROGENY AS A TRACER FOR THE MIXING PROCESSES IN THE PBL

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The natural short lived beta radionuclides in the atmospheric boundary layer are decay products of radon isotopes emitted from the earth surface. The main source of 222Rn, 220Rn and 219Rn into the atmosphere are soil and rock surfaces while the water reservoirs release radon to much lower degree.

The source of radon in the atmosphere might be considered as continuous surface source with quasi constant emission rate thus reflecting significantly the thickness of the mixing layer. The mixing height is a parameter with a high impact on the pollutants dispersion in the surface air.

Radon daughters beta radionuclides attached to the aerosol are measured daily in the frame of the atmospheric radioactivity monitoring program of NIMH at Sofia, Plovdiv, Pleven, Varna and Burgas.

In the present study the relation between the atmospheric mixed layer height and short lived beta radioactivity of radon daughters during the period 2001-2006 is investigated for Sofia station. The radon concentration is estimated from every day measured short lived beta activity of the filter samples, changed daily at 6:00 GMT. The mixing height is estimated from daily radio soundings at 12:00 GMT applying specially developed computer software model and expert approach.

Representative daily data were chosen for cases with predominantly convective conditions.

The qualitative prediction that the changes in radon concentration is in opposite direction to the changes in the mixing height is confirmed in sufficient number of regarded cases. The uncertainty of the short lived beta activity measurements and the influence of some other factors connected with the soil conditions as temperature and moisture content is estimated totally as 40% of every concentration value. The expected opposite tendency is confirmed in about 70% of the cases.

The impact of some meteorological factors as wind direction, velocity, humidity, temperature on short lived beta activity data for Sofia is estimated and the results show no simple statistical relationship.

Keywords: atmospheric radioactivity, urban climate, mixing height, ABL, radon

093 - AUTOMATISATION OF CONTROL OF ECOLOGICAL PROCESSES – ECOLOGICAL MEANING OF REDOX POTENCIAL

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Each specia that carries electrical charge, eigter as a ion, ionic group or even organic group, transmiter and relative change of electrical charge, is participiant of certain redox process. Each redox process is carrier of caracteristical change of redox potential, i.e., carrier of overall change of final caracteristical energetical stage. This change can be traced on accurately defined frevent (energetic) level. By using Tesla's chart of higly sensible frequent analizer and energy superdiving, each caracteristical redox potential can be quality indetified in accurat calculated frequent area and qualitatively scanned. In the article is developed idea of using redox potential as a general and a specific tracing parameter of Eco - System by specifing Index of Ecological Changes (IEC).

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095 - OVERVIEW OF WATER QUALITY OF ALBANIAN RIVERS

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Albania is rich in water resources; more than 150 torrents and small rivers form finally 7 large rivers: Buna, Drini, Mati, Erzeni, Shkumbini, Semani and Vjosa, with a total flow of 1308 m^3/s; therefore, the Albanian rivers are the most important water suppliers in eastern Adriatic, beside River Po in western side (Italy, total flow of 1459 m^3/s). Especially in the eastern, mountainous part, Albanian rivers exhibit a torrential and erosive regime, with large and undulated beds in the Western Adriatic Coastal Lowland.

Data on the population structure of the microscopic periphyton communities of diatoms (siliceous algae) can give a better view of the average quality of the water. The Trophic Index of Diatoms (TIDIA) can evaluate the water quality based on the presence of the main inorganic nutrients (nitrogen and phosphorous); while the relative Saprobic Index (SI), calculated also from the diatom structure, may indicate the presence of degradable organic compounds or the saprobic level of the waters. During autumn 2006, about 35 river stations were visited, representing significant parts of running waters in the whole Albanian territory. It was carried on within the framework of EU project 'Strengthening of the Environmental Monitoring in Albania (StEMA)', focused on the setting up an Integrated Environmental Monitoring Scheme (IEMS), following the requirements of the EU quality directives. The EU standard methods EN14407:2004 and EN13946:2003 were used to sample and clean the diatoms, prepare the slides and interpret the results focused on water quality. The TIDIA oscillated from 1.1 (oligotrophic in Vjosa, Memaliaj) to 3.3 (polytrophic in Ishmi, Gjola). Most of the rivers close to inhabited centers show an eutrophic to eu-polytrohic state, probably as a consequence of relatively high quantity of nutrients (mainly phosphorous), due to untreated urban wastewater; the highest level of trophy were for rivers crossing Tirana town (Tirana, Lana and Ishmi), Fieri (Gjanica), Berati (Osumi), etc. The SI oscillated from 1.3 (class I, in Mati, Shkopeti) to 3.4 (III-IV class in Tirana river). Nevertheless, most of the rivers showed low saprobic levels (class I or I-II), due to low presence of degradable organic compounds, except for the rivers close to main inhabited centers as rivers of Ishmi and Tirana. Often, the rivers with high trophic level were characterized by a limited number of species and a low index of diversity (Shannon index was 1.39 in Tirana (Kamza) and 1.64 in Ishmi (Gjola).

The Swiss National Science Foundation (SNSF), through the Scientific Cooperation between Eastern Europe and Switzerland (SCOPES) program, during May 02 - March 04, supported a monitoring work in 13 stations of the main rivers of Western Adriatic Coastal Lowland, where the most important inhabited and industrial centers are situated. It was observed that the waters of most of the rivers and streams were only slightly polluted, more evident in tributaries from mountainous part. Heavy metals in water, sediments or in biota were low, probably, from the low impact of abandoned mining industry. Also, most of the rivers were oxygenated, and with low nutrients (nitrogen and phosphorous); the upper parts of Mati, Fani and Shkumbini supported the life for the salmonid fishes (> than 9 mg/l O_2). As in the autumn 06, high values TIDIA and SI were observed for Lana and Ishmi, the downstream part of Shkumbini (downstream Elbasani) and Gjanica, indicating a strong pollution of urban origin. One of the most striking results observed were the high values of the Total Suspended Solids (TSS); in all the rivers TSS exceed 25 mg/l, the guide value of EC Directive 78/659:1975 of the third class limit on the quality of fresh water needing protection or improvement in order to support fish life. It showed the high rates of soil erosion, favored not only by the mountainous relief and the typical Mediterranean climate, but also by

unfriendly human activities, i.e. woodcutting, overgrazing or firing in watershed areas, overuse of river beds to obtain construction materials, etc.

A systematic control and the establishment of routine monitoring of waters would enlighten the present environmental state and helps to develop new strategies of waste and wastewater management. It would help Albania to reach the international standards in environmental protection and in living quality of the people.

Keywords: Albanian rivers, Trophic Index of Diatoms (TIDIA), Saprobic Index (SI), StEMA project.

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098 - ANALYSIS OF SOME ENVIRONMENTAL TOXIC ELEMENTS IN WATER RESOURCES OF KOSOVO

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The aim of this paper was to analyze some environmental toxic elements in few water resources of Kosovo using Differential Pulse Anodic Striping Voltametry, DPASV, in universal cell in three electrode system with HDME.

Considerable amounts of these environmental toxic elements are continuously emitted in environment from anthropogenic sources. Since the main source for the drinking water, are the rivers that flow within the territory of Kosovo, it is of mayor priority the quality of water of these rivers and the water mineral sources.

Concentration of Cd^{2+} ; Pb^{2+} and Cu^{2+} ions in all the samples were determined at pH = 1.40 - 2.30 while those of Zn^{2+} ions at pH 3.7 - 4.2. All the determined parameters with DPASV are compared with the results of ICP/MS method. The mass concentrations of lead and copper ions in the analyzed samples were evidently higher than their natural concentrations levels in these kinds of water, while the zinc and cadmium ions were generally in their natural concentrations levels.

Toxic elements results of surface waters are compared with the results of underground waters, with those waters in where there are no anthropogenic

effects. This situation that exists in Kosovo underlines the necessity and importance of reliable drinking water control to ensure that the tolerance limits for the various toxic elements are never exceeded.

Keywords: Water Resources, Environmental Toxic Elements, DPASV, ICP/MS, Kosovo.

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100 - CONCENTRATION OF LEAD, CADMIUM, COPPER, ZINC AND PHENOLS IN THE WATER RIVER OF SITNICA

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Managing and water protection from pollution have a strategic importance for our country.

The Sitnica River is surrounded by agricultural land and settlements with unresolved wastewater discharge positioned downstream from the significant industrial plants. The purpose of this work was to determine the amount of lead, cadmium, copper, zinc and phenols in the water of River Sitnica and to identify potential pollutants in the flow of this River. For this reason four sample places were chosen: Fushë Kosovë (A1), Kastriot (A2), Vushtrri (A3) and Mitrovica (A4).

Sampling and preservation of samples were performed based on standard methods for the water sampling. The level concentration of heavy metals was determined by DPASV (Differential Pulse Anodic Stripping Voltammetry) and SAA (Atomic Absorption Spectroscopy). The level concentration of phenols was determined by UV-VIS spectrophotometer.

Experimental results show that the quality of this water is endangered from heavy metals (Pb, Cd, Cu, Zn) and phenols. The concentration level of phenols in A2 and A3 sample places and heavy metal concentration in all sample places exceeded allowed values of the fourth category of the quality of surfaced waters. Supporting these values we can conclude that the water of this river is polluted in such level so that it can't be used for supply, irrigation, recreation, etc. To this condition contributed considerably industrial water from Kosovo power plants in Kastriot and urban central water which with no pretreatment flow into the Sitnica River. To

prevent the pollution and to begin the revitalization of the bed of this river it is the last moment for the adequate measures to be undertaken.

Keywords: Sitnica River, Heavy Metals, Phenols, Water Quality.

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104 - BOTULISM MORBIDITY IN CONDITIONSOF THE CHANGED ECOSYSTEM OF LAKE BAIKAL

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In this paper the levels of botulism morbidity of Buryatiya population living on coast the lake Baikal are analyzed. Environmental factors which have caused of botulism epidemic process activation of the connected to the use in food omul (the most-used and popular among inhabitants Baikal fish) also have been investigated.

Botulism from the using in food home-cooked omul during last 10 years wins first place among all cases of the food poisonings registered in Buryatiya. Etiological agent of botulism is Clostridium botulinum type E. The major factor of botulism transmission (99% of cases) is Baikal omul of pelagian morphoecologic group and omul's caviar. Its natural habitat includes water's area of lake Baikal from side of Kabansky area and river Selenga.

The greatest quantity of botulism cases is registered in Ulan-Ude and Kabansky area. It makes 88 % from all registered cases in Buryatiya. More than 95% cases of botulism belong to medium-heavy and heavy forms by severity of course pathologic process. The temporal interval 1994-2004 can be divided into three periods with the help of polynomial trend of the fourth order. The first period (1994-1998) was characterized by average morbidity rate 2.4±0.7 per 100000 population.

The second period of sharp rise of morbidity was in 1999-2002 (average morbidity rate 13.3±2.4 per 100000 population). The third period - forward morbidity decrease in 2002-2004 (average morbidity rate 5.7±1.7 per 100000 population),

has been caused by spent treatment-and-prophylactic actions. However, down to the present tense the botulism morbidity rate in Buryatiya's population of is due high and exceeds mean ones in Russia more then 10 times (across the Russian Federation 0.3 per 100 000 population).

There is a high level of biological and chemical pollution in Selenga estuary. Proceeding dump of the economic - household and industrial sewage enriched with sulfates and organic substances, is the reason of increase in ground layers concentration of steady forms pathogenic anaerobic microorganisms, promotes formation of tank Clostridium botulinum type E in territory of Southern Baikal (Buryatiya). Regulated water flow in lake Baikal, and also global warming climate have led to significant changes of a forage reserve Baikal omul of pelagian morphoecologic group. The annual omul's diet has decreased for 42% by weight, there was a replacement of a high-calorific fish forage by the remote and low-calorie forage consisting from pedon and pelagian Gammaridae.

The combination of ecologically caused changes of a forage reserve Baikal omul and the trophic status, probably, produce favorable conditions for circulation Clostridium botulinum type E in hydroecosystem of Selenga and lake Baikal and became the reason of increase of a degree saprophyte carriage Clostridium botulinum type E. So, it becomes the intermediate owner of pathogenic microorganism.

Epidemic process is distributed in territory adjoining to places fish catching and carries the expressed seasonal nature. By comparison of trends of water's temperature in basic spawning area and botulism morbidity reveals direct close connection (coefficient of pair correlation $r=0.74$, $p<0.05$).

Consequences of change hydroecosystem are burdened with adverse social and economic conditions (low average per capita incomes, unemployment) which result in increase in volumes of the use of cheap, poor quality omul, made with infringement of salting technology. Half of persons injured of a botulism are the unemployed, pensioners and invalids. Socially unprotected layers of the population make group of risk on botulism. The increase in turnover of counterfeit production is the important factor of transmission of infection alongside with increase of concentration of the pathogenic agent in objects water biocenose.

High degree of pollution of pollution in estuary of Selenga, largest river, running into Baikal, is a significant risk factor for health of the population and inhabitancy condition.

Keywords: Botulism, Morbidity, Buryatiya, Baikal Omul, Hydroecosystem, Clostridium botulinum

105 - PARTICULATE MATTER IN AIR POLLUTION AND HEAVY METALS OF KOSOVO THERMAL POWER PLANT

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Kosovo is a mountainous farm region which at past was in the process of industrialization because of its reach coal and mineral resources. The problem of air pollution in the surroundings of Power Plants appeared as early as 1954 when Thermal Power Plant of Kosovo has started work in Obiliq.

The city of Obiliq, approximately 5 km north of Prishtina-capital of Kosovo, is the site of one the largest air pollution. Coal - related industries have been a major element of the economy of Kosovo, but created extensive health risk due to environmental pollution with PM and a variety of other substances.

Electricity in Kosovo is produced by two lignite-fired TPP (Thermal Power Plant) "Kosovo A" - (five units) and "Kosovo B" - (two units), with total installed generation capacity of 1,513 MW. Most of the units of the two thermal plants are in poor operating conditions so that the present available capacity of the system is only 841 MW.

The combustion process leads to the generation of emissions to air, water and soil, of which emissions to the atmosphere are considered to be one of the main environment concerns. The most important emissions to air from the combustion of fossil fuels are SO_2, NOx, particulate matter (PM), heavy metals and greenhouse gases such as CO_2. The problem with dust emissions is serious and apparently cannot be solved without major redesign of the boilers. Ash from the both power plants is currently transported by open belt conveyors and is deposited at dumpsites. No environmental protection measures in the dumpsites are taken to prevent ash spreading by wind. Deposition of ash in dumpsites must stop as soon as possible and instead use ash for backfilling of mined parts of the lignite mines. Closed belt conveyors should be used to prevent spreading of fine dust particles during transportation of ash.

Keywords: Fossil fuels, heavy metals, particulate matter.

112 - EVOLUTION OF THE DIURON TOXICITY DURING THE ELECTROCHEMICAL TREATMENT OF WATER

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Diuron [3 (3,4-dichlorophenyl)-1,1-dimethylurea)] is an herbicide belonging to the phenylurea family. It is widely used to destroy weeds on uncultivated surfaces, in particular at proximity of drainage systems and feeders. However, there are growing environmental concerns about diuron, due to its toxicity for aquatic organisms and because it is suspected to be carcinogenic for humans.

Therefore, it is important to develop advanced oxidation processes (AOPs), such as the electro-Fenton method, in order to degrade diuron in environmental waters, and to monitor the evolution of the toxicity during the oxidation process. Indeed, these AOP processes catalytically generate hydroxyl radicals that are strong oxidizing reagents for the organic pollutants, and can ultimately destroy these pollutants and completely mineralize them. But, in some cases, relatively toxic organic intermediates or metabolites may be formed during the degradation reaction.

In this work, we have evaluated the evolution of the toxicity of diuron aqueous solutions containing different initial concentrations of the herbicide, which have been treated by the electro-Fenton method. Samples were collected at various electrolysis times and mineralization degrees during the electro-Fenton traitement. The toxicity of these samples was measured using the bacteria Vibrio fischerii (Microtox®) and green algae Scenedesmus obliquus methods. Our results showed that the toxicity of diuron aqueous solutions of concentrations ranging between 3.0 and 27.6 ppm varied considerably with time. We observed the successive formation of several metabolites which presented a toxicity often more important than that of the initial herbicide. Therefore, to improve the efficiency of the electro-Fenton method in the detoxification of environmental waters polluted by diuron, it was found necessary to apply it during a time long enough (several tens of minutes) to reach a nearly complete mineralization of the herbicide in aqueous medium.

Keywords: diuron; toxicity; AOPs process; polluted environmental waters.

115 - DRINKING WATER QUALITY AS ECOLOGICAL RISK ON HEALTH OF SCHOOLCHILDREN IN SUBURBAN MEDIA

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The City of Nis, Serbia has got 67 suburban settlements. The most of them are supplied drinking water from communal system NIVOS, but many of schools have got local objects for drinking water supplying. Water in suburban school is not used only for purpose of drinking but also for hand washing and hygiene maintenance in school objects. Unsafe water multiplied risk of diarrhoea in schoolchildren and health impact of drinking water is connected with its bacteriological and chemical characteristics.

The aim of the paper was to determine the quality of drinking water in suburbans of Nis and to examine the possible consequences on childen's health.

The results of local water inspection and annual quality reports were used from archive Institute for public heath Nis. The analyses showed that 83,8 % of samples were bacteriological contaminated and 36,8% of samples have chemical incorrection. In "case" group (school children from suburban areas) episode of diarrhoea disease, connected with water, presented in every child minimum once on year, while control group have not got this health problem. Morbidity of intestinal infectious disorders among children was reported permanent from Centre for epidemiology. There is more diarrhoea cases reported from suburban areas then urbanise and some of them are connected in water epidemics.

Drinking water in suburban areas is not examined permanent (only four time on school year) and water quality is became ecological risk on health of school children. Water objects are old and need founds for reconstruction which Ministry for education and Ministry local democracy must collect.

Health sector will give help from its own point of view- elimination health risk from unsafe water between schoolchildren in suburban areas in Serbia. WHO (World Heath Organisation) is 2008 declare for "Sanitation year". This paper gives modest contribution for this world initiative.

Keywords: drinking water quality, ecological risk, schoolchildren, suburban media

116 - CORRELATION BETWEEN LARGE WATER CONTENT AND FRACTAL STRUCTURE IN VOLCANIC SOILS

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Volcanic (allophanic) contain amorphous clays (allophanes), issued from the transformation of volcanic materials which present completely different structures and physical properties compared to usual clays. Allophanes have peculiar physical features very close to that of synthetic gels: low bulk density, a high specific surface area and very large large water content.

Allophanic soils exhibit higher carbon and nitrogen content (among the most important components of green house gases) than the one measured in other clay soils. They are thus interesting in terms of environmental properties especially because of their potentialities as sinks for -greenhouse gases-.

On the other hand these soils retain also pesticides (chlordécone/kepone) content larger than the one measured in usual soils.

We propose that these apparently different properties (large water content, C sequestration and pesticides affinity) can be due to the same factor: the peculiar structure of the allophane aggregates

We study the fractal structure of the allophane aggregates, at the nano scale and show that water content can be as high as 300% and during drying these soils present an irreversible shrinkage conversely to usual clays. We show that the most important part of the water content in these soils is due to the fractal structure of the porous allophanic aggregates.

We propose that this peculiar structure and the associated low permeability and diffusivity could also explain the carbon sequestration. We measured the part of organic matter decomposed during a mineralization experiment and show that the decomposition is lowered as the soils allophane content increase. Because of the low allophanic aggregate permeability and diffusivity, the fluid exchanges and chemical reactions are slow, leading to an accumulation of carbon not chemically transformed.

The same kind of mechanism is proposed to explain why this soils retains more pesticides, the peculiar structure of the allophane aggregates plays the role of a labyrinth which traps the chemical species .

We introduce a numerical model to simulate the structure and physical properties of allophane aggregates. The algorithm is based on Diffusion-Limited Cluster-Cluster Aggregation and numerical results are in good agreement with allophanic soils experimental data. We can derive the permeability of the allophane aggregates and we show that, at the scale of the allophanic aggregates, the calculated permeability is low.

Keywords: water content, fractal structure, allophane, pesticides, C-sequestration

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118 - IRRIGATED WATER QUALITY AND ITS EFFECTS UPON SOIL

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The geographic position of Albania is suitable for agriculture. The moderate temperature and weather conditions provide an ideal climate for its development. As a matter of fact, agriculture is one of the most important sectors in our country.

According to the above-mentioned sector, irrigated water is an essential component of sustainable agriculture. Irrigated water concerns have often been neglected because of available good quality water supplies. Recently, in many areas this situation is changing as a result of human activities.

The objective of this study is to help Albanian farmers providing and choosing suitable alternatives related to potential water quality problems that might reduce production under conditions of use.

Keywords: agriculture, water quality, irrigation, Albania

124 - ASPECTS CONCERNING WATER CONSUMPTION IN LIVESTOCK UNITS

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Water Law 107/1996 modified and completed mentioned that for the rational use and protection of water resources quality, the water users must to adopt production tehnologies with reduced water requirements and as low polluting as possible, to save water by recycling or reuse, to eliminate the water and to diminish the water losses, to reduce the pollutants discharged together with the waste waters and to recover the useful valuable substances contained by the waste waters and the sludge.

The water users which are not provided with water treatment plants or installations or whose existing installations require additions, expansions, re-equipment or functional improvements, shall be obliged to build and put into operation water treatment plants and installations of appropiate capacity and effectiveness, based on a phased programme.

This paper make a short presentation about methodes used for to diminish the water losses in livestock units. It specified that rational use of water take to little evacuated water volume and of course to little quantities of pollutants. The following actions shall represent methodes for improvement quality and quantity of water: the changes of tehnologies, the maintenance and good exploitation of the water quality treatment plants and installations and repair of installations used in the water supply and sewerage treatment systems.

Waters Directorate may institute a special supervision regime in case of non-compliance with the measures established for ensuring the conditions stipulated in the water management licence. Throughout the duration of such regime, the water use and treatment shall be done under the direct control of the personnel specifically. All the supplementary expenses incurred by the implementation of the special supervision regime shall be borne by the water management licence holder.

Keywords: pollutants, water losses, waste waters, phased programme

128 - GROUNDWATER MONITORING IN THE PROXIMITY OF AN ASH STORAGE PIT

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In this paper we present the way an ash storage pit of a thermal power plant is able to influence the environmental factors such as soil and water. A real and very threatening to the environment and health case study will be presented. In the proximity of the Arad thermal power plant that provides the heat carrier for Arad city (Romania) is performed also the tapping of groundwater. There are 102 drillings that supply the necessary drinking water for a city of 200.000 people. Because the ash storage pit is not conformable to standards on windy periods of time the ash is blown towards the drilling area and a nearby locality. Due to this fact we are able to show the influence of these fine ash particles upon the soil and water-bearing bed from the surrounding area especially after long raining periods.

After the sampling of soil and water the laboratory analyses results are examined and used as entry data for comparison reports which started in year 2000 and continue to the present. The transport of ash particles to the surroundings and their impact over the environment needs an implementation of a groundwater monitoring program in the area of Arad city. The purpose of the groundwater monitoring program for the Arad city area is to provide all the data necessary to take immediate decisions and actions in the field of water management in real time. In this way it is possible to know at any moment the status of water and environmental resources at local and national levels. The paper demonstrates the high possibility of the polluting ash wave to interfere with the groundwater drilling area of Arad city. A mathematical model of pollutants transport in water-bearings is built and a real time monitoring solution for the monitor drillings of the power plant is presented.

The paper strongly demands the necessity of implementing a groundwater monitoring program.

Keywords: ash storage pit, mathematical model of pollutants transport, groundwater monitoring program

131 - ASSESSING SUITABILITY OF WATER FOR IRRIGATION IN BULGARIA

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The drying up, the intensive usage of near future almost all water reserves of good quality in lots of regions in Bulgaria and their irregular distribution on the country area, has shown that the part of the available set up irrigated area should use water of poorer quality. Quality control on the water for irrigation is needed to avoid emerging problems as decreasing the yield of agriculture and worsening its quality at using inadequate quality water.The development of a assessing system for the suitability of the water for irrigation aims to protect cultivated crops at using lower quality irrigation water. The system use laboratory analysis information, cultivated crops data, soil and agro-climatic characteristics, irrigation technology, legal rules and some additional parameters.

The paper presented the main directions for determination of applicability of irrigation water at various crops on the basis of the assessment of its quality, exactly - the construction of irrigation water quality indicators database and assessment of the irrigation water quality, focusing on the methodology for decision-making for applicability of irrigation water at various crops and on the recommendations' elaboration for irrigation water considering qualitative parameters of the available water. The database includes permanent information about the impact of the irrigation water quality on the agricultural production, personal information about water users, data about the water sources and its water samples, water indicators from laboratory analysis.

Keywords: Water Quality Assessment, Irrigation, Methodology, Assessing System, Database

132 - ASSESSMENT AND USAGE IN AGRICULTURE OF WATER FROM WASTEWATER TREATMENT STATIONS

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In agriculture of lots of regions of Bulgaria and Slovakia is a shortage of economically effective water sources for irrigation with suitable quality indicators because of their irregular distribution. In the same time, numerous stations for artificial biological treatment of wastewater were established in both countries. The treated water due to its high content of organics worsens the quality characteristics of the intakes, mostly river streams. Due to the negative water balance of the countries, which restricts the development of the irrigated agriculture, the usage of treated waste water for irrigation in the agriculture fields of the settlements is an option not only for the intensification of the agriculture but for the protection of the water flows from pollution, as well. The main aim, the fundamental goal of the work is a development and an implementation of the system for assessment and usage in agriculture of the treated water coming from wastewater treatment stations. The objectives are the solution of specific theoretical and practical tasks, as follows: Assessment of the treated water effect as an product of fertilizing in the greenhouses and field experiments and development of a system for agro-ecological assessment of the treated water; Development of technological version of environment friendly usage of treated water in agriculture, depending on crops and soil requirements; Implementation of the technology in agriculture as irrigation water for maintaining and the soil fertility at water scarcity conditions without increasing the risk of environment pollution. The system assists solving some environmental and economic problems of the society, which are connected with the sustainable agriculture development.

Keywords: Treated Wastewater, Irrigated Agriculture, Soil Fertility, System, Technology

139 - PCA STATISTICAL METHOD FOR INTERPRETATION OF LEVELS FOR PCB, DDT AND HCH IN FISH AND MARINE FOOD SAMPLE FROM ADRIATIC SEA

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Organochlorinated compounds such as polychlorinated biphenyls (PCBs) and organochlorinated pesticides are widely distributed contaminants that can induce various toxic responses including immunotoxicity, carcinogenicity, and adverse effects on reproduction, development, and endocrine functions. From the Vietnam War in 1970s to the Belgium crisis in 1999, a great concern has been raised about contaminating of food with PCBs. Synthetic pesticides have been used since early to mid-twentieth century when insecticidal properties of DDT were recognized. DDT was first introduced on a large scale to fight fleas, lice, flies and mosquitoes and reduce the spread of insect borne diseased such as malaria and yellow fever. Organochlorine pesticides are the first class compounds introduced in agricultural and civil uses to counteract noxious insects and insect-born disease. In general organchlorinated compounds are lipophilic with noticeable chemical and environmental stability. Food is generally recognized as the main source of human intake by organchlorinated compounds. More than 90% of the total daily intake of these contaminants is derived from food.

The study included the analyses of fish, mussels and marine foods collected between December 2004 and March 2006 in Albanian market and producers with origin from Adriatik Sea. The organchlorine pesticides detected were HCHs (a-, b-, y- and e-isomers) and the DDT-related chemicals (o,p-DDE, p,p-DDE, p,p-DDD, p,p-DDT). Analysis of PCBs was based on the determination of the seven PCB markers (IUPAC Nr. 28, 52, 101, 118, 138, 153 and 180) measured by gas chromatography electron capture detection. These compounds were measured on the muscle tissues and all results were expressed on a fresh weight basis. The results of surveillance on indicators polychlorinated biphenyls are study with PCA statistical method. All samples had PCBs and pesticides chlorinated content far below the EC Regulation (2375/2001/EC) limits.

Keywords: DDT, HCH, PCBs; Albanian food; PCA, Chemical analysis

142 - THE MONITORING PROGRAMME FOR THE GROUNDWATERS IN ROMANIA: CASE STUDY THE IALOMITA-BUZAU WATER DIRECTION

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In Romania the monitoring and knowledge activity of the groundwaters is made on the hydrografic river basins through the observation wells for the shallow and depth groundwaters. The majority of this wells belongs to the National Hydrogeological Network, but for the pollutants and catchments monitoring exist local networks.

The Ialomita-Buzau Water Direction is one of the eleven Water Direction from Romania and it is situated in the south-eastern part of our country.

In 2006 it has begun the new monitoring programme according to the Water Framework Directive on the base of the monitoring guide proposal in Romania.

The types of the groundwater monitoring programmes will be: S - surveillance, O - operational, P - for the potability, VZ - for the vulnerable zone at pollution with nitrates from the agriculture sources.

The monitoring can be: qualitative (physical-chemical and bacteriological indicators) and quantitative.

Keywords: monotoring programme, groundwaters, well.

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146 - ASPECTS CONCERNING THE ANTROPICAL PRESSURE ANALYSE IN THE TARNAVA RIVER BASIN

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In order to analyze the anthropical pressure in the Tarnava river basin it was selected and processed a series of statistical data in reference to the land use (agricultural lands, arable lands, forests, grasslands, hayfields, vineyards, orchards etc.) at county and locality level. Based on the obtained data, we calculated the human pressure indexes.

This indexes make evident what are the directions through which man intercede in the biotical casing structure. However, the data analysis demonstrates that in the Tarnava River basin existed a clear difference between the localities afferent to the mountain areas, hillock and mountain depressions. The acquiring of values of these indexes corroborated with water quality in all analyzed sections, which are influenced by important successive, residual and industrial pollutions, permitted to achieve a classification of lands from the Tarnava river basin according to anthropisation degree of these extents.

Keywords: antropical pressure, antropical pressure indexes, antropisation grade.

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148 - THE EPIDEMIOLOGICAL IMPORTANCE OF CHEMICAL AND MICROBIOLOGICAL EVALUATION OF WATER ON LIVESTOCK FARMS

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Water is life. In this point of view, water is very important for all, human, animals and plant's life. However, if the water is not clear, that means it doesn't contain hygienic parameters, it's dangerous for life.

We must to suffice the quantity and quality water requirements, on all poultry and pigs farms. The water needs for animal drinking and for work operation on the farms. Therefore, it must determine the hygienic status of water, which means its chemical composition and microbiological charge.

The aim of this article is to determine the level of water pollution and its chemical composition and microbiological charge, in albanian farms.

During the monitoring period, we evaluated the chemical composition of water:

- Determination of water reaction (pH)
- Hardness of water.
- The content of mineral and organic matter.
- Other matters with organic origin, like ammoniac, nitrate (-NO_2), (-NO_3).
- The content of toxicant matter.

And the microbiological charge of water:

- The total number of microorganisms (saprophyte and pathogen) in 1ml water.
- The coli microorganisms content.
- The faecal streptococcus.
- The toxic microorganisms.

The metodology for determination of microbiological charge of water is based on the directions of Union Community, like STASH 2639/11:1989, STASH 3904:1988 and ISO 5813:1995 (Direction of UE, nr. 80/778-1993).

Keywords: Water polluted, groundwater, chemical composition of water, microbiological charge of water, livestock farms.

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152 - APLICATION OF MODELS IN THE INTEGRAL MANAGEMENT OF WATER COURSES WATER QUALITY ON THE EXAMPLE OF THE RIVER TOPLICA CATCHMENT AREA

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The document, "Framework Directive on Waters " (Directive 2000/60/EC, 2000), the EU has determined its long term policy in the area of waters. This directive introduced new principles and standards in creating and realizing the policy of sustainable usage of waters and water protection. Regarding that the EU countries are the most advanced in finding the concrete solutions, the Directive will help integration and unification of the water resources management policy on the basis of the sustainable development, not only in the EU, but in the wider European area.

Considering the complexity of the issue, mathematical models are becoming increasingly important for implementation of the Framework Directive on Waters, especially in the part of water protection from pollution and management of water resources quality in the river basins.

The model, primarily, provides a quality estimation of pressures on the water status, detection of status change causes and an optimization of estimation methods. Secondly, the models can enable research and analysis of the future actions' of restoration of aquatic eco-systems effects and support the choice of

most sustainable options. Finally, models can help in finding deficiencies in our knowledge of river basins and in defining of cost-effective monitoring programs.

At the Faculty of Civil Engineering and Architecture of Nis, the model and program system for support to the integral protection of water resources from pollution within river basins have been developed in stages. This model provides modeling of the water quality status in the water course, through a "pollution propagation" method, recursively, that is, the water course is monitored along its entire length, and the status of its tributaries is taken into account as well, which allows analysis of the influence of existing concentrated polluters of the water courses, not only at the point of outlet, but downstream and in the entire basin area. A model conceived in this way can be successfully implemented both in the design phase, and later, in the operative management phase, for defining solutions, which are technically and financially corresponding to the needs of users and requirements of protection of water resources in the catchment area, according to the Framework directive on waters.

This part points out the importance and the role application of mathematical models in implementing the Framework Directive on Waters, and offers presentation of the model and the program system, which is being developed at the Faculty of Civil Engineering and Architecture of Nis, and of the assumptions and principles on whose basis the system was developed.

Potential of this model and the program system for support of protection from pollution and water resources quality management in the areas of river basins, have been presented on the example of the Toplica river catchment area in southern Serbia.

Keywords: integral protection of water resources from pollution, water quality modeling, Framework Directive on Waters

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160 - MARSHLANDS OF THE FPC RYCHTALSKIE FORESTS IN POLAND

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The aim of the present work is a description of a multi-year field hydrological research carried out on the area of the Forest Promotional Complex (FPC) Rychtalskie Forests in Poland. The work focused on indicating the stability threats

which the areas face.

Forest Promotion Complexes are functional areas carrying a particular ecological, educational and social significance.

The field investigations were carried out on the marshlands of the forests in focus. Three experimental plots were selected for the detailed investigations. They were micro-catchments, which are almost entirely situated on forest marshlands. This is the most significant element in the proposed experiment since the core of it is an evaluation of the outflow from the defined area with excessive moisture.

Methods of determination of major indexes of soil, ground and surface water chemical pollutants: reaction pH, ChZTCr, ammonia nitrogen, nitrite nitrogen, nitrate nitrogen, sulfates, chlorides, orthophosphates, Cu, Zn, Cd, Fe, Co, Cr, Ni, Pb, Mn, Na, K, Ca, Mg, hardness, electrolytic conductivity - according to Polish Norms.

The marshlands in focus are characteristic for their high retention capabilities. The annual outflow is relatively low, reaching about 4% of the annual precipitation sum, and it occurs only in the winter half-year and May. Ground waters are found shallow at the depth of approx. 1m below ground level.

The following trends were calculated basing on the data from Siemianice (1975-2006): mean annual air temperatures (+0.041 °C/year) and annual atmospheric precipitation sums (-1.573 mm/year). The above trends are significant statistically respectively at the significance level a=0.05 and 0.25. Positive air temperature trend will undoubtedly stimulate evapotranspiration growth which depends on many factors, among others access to water. It can be thus assumed in the forecast that evapotranspiration will not undergo significant changes. The outflow from the investigated areas is insignificant so it can be not taken into consideration in the prediction.

Finally the prediction of water relation changes in the area in focus, expressed by groundwater level changes, can be founded on negative atmospheric precipitation trend. If it is assumed that significant changes in marshy ecosystems will occur alongside with a decrease of average groundwater level by approx. 50 cm (50% of the present average groundwater level), as a result of decreasing annual atmospheric precipitation sums, it can be calculated that this will happen in about 100 years.

Alongside with the accepted assumptions and soil porosity in the aquifer of 34 %, after 100 years decreasing precipitations will bring about lowering of groundwater levels on average by 46.3 cm. The above calculations show only the order of magnitude corresponding to the period, after which such a drain up of forest marshlands is probable that will lead to changes in their character, and they will not stay abundantly moisture habitats. The carried out chemical investigations did not show an excessive cumulation of chemical pollutants in soils, as well as surface and ground waters of the Complex.

163 - COMPARATION BETWEEN DRINKING WATER QUALITY OF POINT-OF-USE (POU) TRETED WATER AND TAP WATER

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There are a number of methods available to improve or enhance drinking water quality. People work very hard to improve treatments like purification and disinfection to get perfect product-drink safe for health and necessary for life called simply water. POU (Point Of Use) filters are used one or few technologies whose produced pure water in one object for drinking and preparing meals. Many of the proven technologies are commonly used to effectively reduce specific contaminants in drinking water. EPA (Environmental protection agency) has set drinking water standards for approximately 90 contaminants with legal limit known as maximum level. Water that meets these standards is safe to drink, although people with severely compromised immune systems and children may have special needs. But what happens when POU filters treated water which doesn't have any contaminants- Advertising can sell anything to anybody regardless of their true needs. No single unit takes out every kind of drinking water contaminants; you must decide for yourself who type best meets your needs or you may consulted health professionals.

Water degradation in water treated with POU home system is observed where water entry is from communal system and primary water goes through purification and disinfection-standard methods.

The aim of this paper is to compare drinking water quality before and after treatments with POU household filters.

Laboratory IPH Nis analysed 35 samples from two different filter types: 21 samples from reverse osmosis filters and 14 samples from ion exchange filters. Samples were taken in series: before filter (tap water from communal system NIVOS), storage and final (filtered water). Results showed that all of primary water corresponding Serbian Drinking Water Standards and hadn't got any contaminant. Two dominant reasons of contamination were founded in samples after filter purification: bacteriological contamination and demineralization. Samples from reservoirs and final water from reverse osmosis filters had got bacteriological growth and fatal drop essential minerals like calcium and magnesium (average forty times). Ion exchange filters produced water with bacteriological contamination but without changes in mineralisation.

Both of filter types have got carbon part. It may be a reason for bacteria presentation

in filtered water beside primary water was clean of bacteria. Water treatment process at the home can be adjusted to obtain desirable levels of calcium and magnesium in drinking water but not demineralised water that some filters do.

After installation of POU household system, which can do only professionals, there must exist some regulated rule for obliged water sampling before and after filtering process for comparation drinking water quality. Permission for use filtered water will be given after analyses of water quality and its health risks from health professionals. Water quality degradation is bad publicity for POU household filter sellers and they may sale filters on areas with local but not communal supplying water system. Water from communal system is already purificated and it is on permanent monitoring from health sector.

In Serbia, Regulation about filtered water still not exist and this paper give initiative for making new water standard toward Directive EU for better health consumers and satisfaction health professionals.

Keywords: POU filters, water quality, bacteriological growth, demineralisation

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165 - DISCRETE TIME MODEL FOR OPTIMAL HARVESTING IN SPACE LIMITED SANITARY RESERVOIR

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In this paper optimal harvest problem is investigated, for some periodic population of fishes. An mathematical discrete time model is developed using a dynamic programming methods to approximate optimal control and optimal harvest. Corresponding program solution is realized using a Mathematica symbolic language, and some numerical results are presented. Model developed is controlled by statistical model based on control harvesting. As a pilot model is used example of stationary reservoir of MMTP in coalmine at Citluk, near Soko Banja, Serbia.

Keywords: modeling of bio-systems, discrete model, fish population, optimal harvesting, sanitary reservoirs, and bio-statistics.

166 - APPLICATION METHODS CCME WQI (WATER QUALITY INDEX) IN CONTROLLING LAKES AND ACCUMULATIONS ON EXAMPLE ACCUMULATION BOVAN

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Method CCME WQI (Water quality index) in controlling lakes and accumulations presents gathering of taken scientific systematic measures, which is used as a basic for comprehension characteristics of lakes, influence on water quality, also possibility of predicting lake water quality changes through time. This method using chosen parameters for quality, with their systematization defines in very complex way influence on man and live aquatic world. Water quality index (WQI) represent condition of water body in respect of quality, in other words complex information is represented in simple and easy way. In this study are used Republic weather bureau-s (Serbian) information about measured water quality parameters accumulation -Bovan- in period of 1997-2005. Using this method on example accumulation -Bovan- it is noticed that from 16 parameters for method CCME WQI (measured 14) only two of them show exception from given quality: ammonium ion and chromium. That points to insufficient protection of accumulation more exactly Anthropogenic pressures, specially because of chromium periodical appearance. With further research it can be established pollution sources and take appropriate protective measures. Generally, water quality in accumulation -Bovan- in period of 1997-2005. is good. From total 22 measuring in observed period, we have only two exceptions in spot C1 in the beginning of accumulation in 1998. and in 2004.

Keywords: Water quality index, water body, parameters of quality, Bovan

167 - PREVENTION OF OXYGEN DEPLETION AND FISH KILL IN WWTP AQUACULTURE POND BY SIMPLE PREDICTION MODEL

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One of the last stages in purification of waste water is by aquaculture pond using macro biological cells - fishes. In such outdoor ponds, oxygen depletion events can occur at anytime, but most likely to cause fish kills during summer hot weather. Aquaculture pond model can predict dissolved oxygen using small number of measurements and very simple numerical model. Alarm system can be activated urgently when the oxygen level drops below a certain concentration, depending on fish species.

Such a model is realized for WWTP at Citluk coal mine, close to Sokobanja in Serbia, and explained in this paper.

Keywords: Dissolved Oxygen (DO), WWTP (Waste Water Treatment Plant), Oxygen Depletion, Fish Kill, DO Model, Aeration.

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173 - CALCIUM AND TOTAL HARDNESS IN DRINKING WATER IN NISH AND PROKUPLJE

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Nowadays all studing surveys in our country about chemical parameters in drinking water are based on hygiene capability, ignoring their health effects. From the middle of last century WHO take care about all studies with appropriate statistics correlation between heart disease and low level of total hardness in drinking water.

Aim of this work is comparative presentation of chemical parameters hardness and calcium in drinking water in two public systems - Prokuplje and Nish.

During the july and august 2007 with routine observation of 320 drinking water samples in two public supply systems Prokuplje i Nish, we take up in examination extra parameters- calcium and hardness. Samples were analized in Institute for health protection laboratory in Nish by high occupational stuff with EDTA titrimetic methods.

Our results show that Nish drinks middle-hard drinking water with total hardness 139 mg/L as $CaCO_3$ or 7,78 °dH and average concentration for calcium is 44,98 mg/l.

Drinking water in Prokuplje are from two water supply systems Bresnica, with low degree of hardness with 4,9 °dH and Grcki mlin very hard water with total hardness 20.4 °dH. We find out statistics significant difference between this two town supply systems, as well as difference between two observing parameters.

These parameters show certain level of stability and we suggest their routine observation during 2008, to establish rapport between human health and concentration of this parameters. Shown results could be excellent start for future exploration.

Keywords: drinking water, calcium, hardness, health effects

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175 - THE ACCIDENTAL POLLUTION OF OCNELE MARI AREA FROM 2004

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The pollution of water became in the last decades an acute problem in the frame of environment. In the first part of the paper it is presented a general description for the Ocnele Mari area, area where the salt exploitation is one of the most important economical activity.

In the second part the paper present the evolution and the effects of chlorides on the Paraul Sarat and Olt rivers in 2004 due to the accidental environment produced in Ocnele Mari area.

Keywords: water quality monitoring, accidental pollution, chlorides, salt, environment

177 - COMPARISON OF MICROELEMENTS CONCENTRATIONS IN MUSSELS (MYTILUS GALLOPROVINCIALIS) AND SEA GRASS (POSEIDONIA OCEANICA) FROM BOKA KOTOR BAY DETERMINED BY AAS, ICP-OES AND ED-XRF

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The aim of this research was to determine the correlation coefficient on the occasion of measure the content of microelements in mussels (Mytilus Galloprovincalis) and sea grass (Poseidonia oceanica) from Boka Kotor Bay at Montenegrin coast with three different analytical methods. All samples were collected in autumn 2006. The used methods for microelements analysis were Atomic Apsorpcion Spectrometry (AAS), Inductively Coupled Plasma (ICP-OES) and Energy Dispersion X-ray Fluorescent Spectrometry (ED-XRF).

Prior to examining the quantities of metals present in marine mussels and sea grass, these were subjected to the usual sample preparation (freeze drying) whereby organic matter underwent decomposition with concentrated nitrogen acid and 30 % hydrogen-peroxide.

Obtained results of these three used methods were compared by the correlation coefficient (r) and the determination coefficient (r2). By analyzing these coefficients values, the best data agreement were obtained by using AAS and ICP methods, in bout cases of examined samples.

Some differences between data obtained by ED-XRF and AAS in the case of sea grass and ED-XRF - ICP in the case of mussels samples, probably were consequences of mistakes during samples preparation and analysis, depending on samples' age, unfitting standards and differences of limit detection of used methods too. This is predominantly related on data obtained by ED-XRF method.

178 - METAL ACCUMULATION IN BIOLOGICAL INDICATOR (POSIDONIA OCEANICA) FROM THE KOTOR BAY

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This work represents a summary of correlation coefficient (r) between metals and Concentration factor (CF) determined for sea grass (Posidonia oceanica) sampled in Boka Kotor Bay at the Montenegrin sea coast of the Southern Adriatic during the Fall and Spring seasons of 2005 and 2006, respectively. As a result of this work, Posidonia oceanica have found a new application as sea water polution indicators.

The content of microelements (Mn, Fe, Co, Ni, Cu, Zn, As, Cd, Hg and Pb) were measured and comparated in sea water and sea grass. After analyse of correlation coefficient between metals in sea grass Posidonia oceanica L. Delile it was concluded that there were positive correlations between some metal pears, but the concentration of Pb seems to be exponentially related to Fe. An antagonistic relationship between more metal pairs was obtained. After analysis of concentration factor could be concluded that Boka Kotor Bay, a eutrophic area where Posidonia still egsists, shows low toxic metal bioavailability.

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185 - THE BULGARIAN EMERGENCY RESPONSE SYSTEM DEVELOPMENT FOR DOSE ASSESSMENT IN THE EARLY STAGE OF ATMOSPHERIC ACCIDENTAL RELEASES

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The need of fast and reliable estimation of the possible impacts of hazardous substances transferred from long range air pollution requires development and

implementation of an adequate diagnostic and prognostic modeling systems - so called Emergency Response System (ERS) based on real and forecast meteorological information and numerical models accounting for the transport, dispersion, chemical and radioactive transformation of pollutants and the removal processes.

The Bulgarian Early Warning System (BERS) for transport of radioactive pollutants was developed at NIMH during mid 90's of the last century and was tested over a number of international exercises and inter - comparisons. The system was adopted for operational use and calculates and visualizes twice per day the trajectories from the Nuclear Power Plants (NPPs) over Europe and the North hemisphere.

The system is developing in several directions for evaluation of the human health effects in case of nuclear accident:

- accounting for the mixture of different radionuclides;
- grouping the radionuclides depending on their dispersion properties and the task specifics;
- upgrading the ERS with a "dose calculation block" where the output of the dispersion model is transformed into fields of doses needed for decision making;
- adaptation of release scenarios for creating a source term data base.

Here the description of the development of the BERS for the case of atmospheric transport of radioactive pollutants is presented for several test cases and the results of the numerical simulations are shown as maps of concentration, deposition and dose fields.

Numerical experiments are performed with the text cases for selected NPPs situated in different regions of Europe for two scenarios characterized with different atmospheric conditions. The results show the importance of the meteorological parameters influencing the diffusion and transport processes as well as the importance of the source term release scenarios.

Keywords: Atmospheric modeling, accidental releases, radionuclides, dose calculation.

188 - REVIEW OF WATER SUPPLYING SYSTEM AND RESULTS OF EXTERNAL MONITORING DRINKING WATER QUALITY IN CITY OF NIS

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Integrated water resources management and capacity building give to consumers enough water with satisfied quality. Lack of consumers demands is only possible in water supplying system with good construction characteristics, permanent maintenance and external monitoring water quality.

This work presents results of two years examinations of quality drinking water in water supply system of Nis and its constructive characteristics. The aim of this paper is review of water supplying system and results of external monitoring drinking water quality in city of Nis.

Communal system NIVOS has got six water resources: five water protected springs and one scoop water from river Nisava. Undrground closed protected spring are Ljuberadja, Divljana, Mokra and Studena; opened spring are Krupac and river Nisava as surface water.

During the period of two years (2005 - 2006) 6554 samples of drinking water were examinated and 6262 samples of physical - chemical correctness were analysed. The water was examinated at Institute for public health of Nis (which has laboratory acredited in standards quality of work ISO/IEC17025 since 2005. year). Results of examination were interpreted according to the Regulation standard of Hygienic Correctness of Drinking water. It was found very low percent of bacteriological (0,17%) and physical incorrectness (1,0%). Having access to the table figures it can be noticed that chemical water quality demonstrated low percentage of deviation samples compared with the Regulation in all parts of the system. The chlorine contents of 98% of samples were within a desirable range of concentration up to 0,5mg/l. The value for KMnO4 contents shows on low organic content. According to the percentage of the negative results, it can be concluded that drinking water from the town water supply is safe and healthy for drink. Institute for Public Health of Nis were confirmed good water quality from the sanitary point of wiew. Water quality and safe quality are indicator of health status of population. Water supply system NIVOS gives safe and healthy drinking water (it is being called a rival to Vienna water).

Permanent external monitoring and supervised water supplying system are integrated prerequisite for lack of consuments demands on water quality.

Water quantity and quality are important indicators of monitoring health status of population. Permanent external monitoring and supervised water supplying

system are integrated prerequisite for eradication of consumers demands on water quality. Also better information system for consumers about drinking water from communal system NIVOS will help indicated high level of knowledge about water quality.

Keywords: drinking water, water supply system, external

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196 - INTEGRAL ENVIRONMENTAL ASSESSMENT OF OGOSTA RIVER BASIN (NORTHWESTERN BULGARIA)

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The present catchment basin of Ogosta river takes an area of 3,110 sq km. The forming of river system in this basin is a result of diversities of endogenetic-exogenetic geodynamics of Fore Carpathian basin and Carpathian-Balkan horst-block mountain chain in Neogene and Quaternary. The cyclic tectonic and climatic undulations lead to radical changes of regional erosion base and local bases as well. These radical changes resulted in realization of multiple reorientations of water basins on the background of disappearing Neogene basin and simultaneously raising up of Carpathian-Balkan mountain chain, more precisely - of West Stara Planina mountain. At the lower courses of the rivers belonging to Ogosta river basin the Pleistocene loess complex up to 110 m thick with its five buried soil horizons mark and fossilize the development of older river valleys. The varied geological-tectonic structure facilitated the development of selective erosion and denudation to various extents. This resulted in the origination and shaping of multiple gorges, falls, valley widening, mountain and plain karst, asymmetric and symmetric parts, different river bed dips, etc. The erosion, erosion-denudation, deflation and karst relief in the Ogosta river basin besides the intensified recent morphodynamic processes is strongly influenced by the anthropogenic impact as well from the remote past to the present days (mining, agriculture, engineering, etc.). As a result of these processes in the basin are found 94 terrains strongly polluted with substandard substances in soil and water. With the purpose of improving environmental quality an integral assessment of all its compounds is made. Original maps are enclosed in this work.

Keywords: environment, environment' compounds, integral assessment, Ogosta river basin, Northwestern Bulgaria.

197 - HOLOCENE AND RECENT ALLUVIAL SEDIMENTS IN OGOSTA RIVER BASIN (NORTHWESTERN BULGARIA) AND ANTROPOGENIC IMPACT ASSESSMENT

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The catchment basin of Ogosta river takes an area of 3,110 sq km. It involves well developed river system of 40 feeders inclusive. In the region of Stara Planina mountain and the Fore Balkan the rivers are with narrow beds but in some places form large valleys. In the Danube lowland these rivers form wide floodplain terraces and strongly meandering river beds.

The thickness of Holocene and recent alluvial sediments varies into wide ranges (from 1 m up to 40 m), as well as the sedimentation environment is changeable, too. The floodplain terraces width varies from 1 m to 2 km. The alluvial sediments in the Ogosta river basin are subjected to strongest anthropogenic alterations as a result of the urbanization, agricultural activities, mining industry, etc. Ninety four recent terrains strongly polluted with substandard substances in soil and water as a result of the anthropogenization. Some of the terrains are so strongly polluted with heavy metals and arsenic that they are defined as non-reclaimable. Generally, the pollution came in the period 1964-1979 from mining and flotation plants, which are located in Ogosta river upstream. Heavy metals and arsenic transportation is realized by river water during the high water, and their accumulation in alluvium comes in low water periods. The strong intensification of living style and agriculture, especially in the second half of 20th century also increased the alluvium pollution with chemical substances, living and construction waists. The poly-functional usage of alluvial sediments from the floodplain terraces of rivers from Ogosta river basin extremely reduced their quality. In the last years this necessitates fulfillment of extensive and integral studies and monitoring, which to the present remain still incomplete. The work presented makes assessment of Holocene alluvial sediments, natural and anthropogenic impacts and their stability.

Keywords: Holocene, sediments, anthropogenic pollution, Ogosta river, Northwestern Bulgaria.

204 - MODELING DISSOLVED OXYGEN IN WASTEWATER TREATMENT PLANTS

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Functioning of Wastewater Treatment Plants (WWTP), especially macro-biological parts are strongly influenced by dissolved oxygen and its balance in distinct ponds. Measuring a DO concentration enables active monitoring and management of WWTP functioning. By on-line or periodic measurements of DO concentration some malfunctions and disturbances, from which oxygen depletion and possible fish-kill, can be avoided. For preventing regulation of WWTP functioning, modeling of all functions is necessary. As a crucial parameter, DO demands special carefully modeling.

Using Continuous System Modeling Program (CSMP) enables comprehensive use of digital simulation of continual processes. It uses the block-oriented input language familiar to user and it is very simple to be used by users without, or with very little experience. The program is especially useful because of speed and access of interactive operation for urgent intervention during the simulation. In our experiment we used this program to predict change in concentration of dissolved oxygen in different parts of WWTP, and especially on the outlet to river. The model has been tested on the WWTP at coal-mine Citluk near Sokobanja.

Many fish kill cases in Serbian rivers this summer demand urgent installation of such a models for all critical river basins, what unfortunately depends on authorities.

Keywords: Functioning of Wastewater Treatment Plants (WWTP), Measure, Dissolved Oxygen, Prevention, Continuous System Modeling Program.

209 - GROUND WATER POLLUTION IN MITROVICA AND SURROUNDINGS

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Due to its large use, water is considered as the most important resource in XXI century, and sometimes this century is called as century of water. In order to protect the water quality and to promote the rational use of water, United Nations declared the 22nd of March as World water day (the resolution A/RES/47/1993), whilst the period 2005 - 2015 is declared as Second International Decade of water.

In normal living conditions a man needs 1-2.5 l of drinking water per day, whereas the daily expenses in developed countries are much bigger (up to 1500 l per day).

Regions (countries) with less than 1700 m^3 water per capita per year are considered as countries in water deficit. The drinking water quantity in Kosova is approximately 1600 m^3 per person per year, and consequently Kosova belong to the range of poor drinking water countries in Europe and wider.

The surface water quality in Kosova is not satisfying, whereas in Mitrovica region the state is concerned. By rapid industrial development, concentration of population in urban areas, inadequate treatment of waste waters and their discharge in water flows (rivers), the quality of surface and ground waters in Mitrovica area is decreasing.

In the best way, it can be explained by comparison of water quality in valleys (where untreated waste water is discharged) and the quality of water in river resources points, where the water quality is good.

The topic of this paper we will be the state of surface waters in two main rivers of Mitrovica: Ibri and Sitnica.

Keywords: Surface water, pollution, Mitrovicë, River

212 - GROUNDWATER AND SURFACE WATER QUALITY OF EASTERN ALGERIA : A CASE STUDY OF THE ANNABA, SKIKDA, EL-TAREF, GUELMA, SOUK-AHRAS AND TEBESSA REGIONS

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The study area is located between the Mediterranean Sea and northern Sahara. The climatic regime is therefore variable: Mediterranean to the north and arid to the south. Precipitations decrease dramatically from 1200 mm/year to 300 mm/ year towards the south. The hydrographic network is very dense; Seybouse, Mellgue, Medjerda, Kebir east and Kebir west rivers run though the region carrying large amounts of solids and liquids. Water of surface aquifers are characterized by high salinity whose origin is identified using the following methods: (1) statistical methods: principal component analysis shows the distribution of chemical elements that are at the origin of the salinity. (2) Marine intrusion: the dryness and pumping excess could have an effect on the interface rupture between fresh water and saline water. (3) Stuyfzand method based mainly on chloride contents allow the determination of the different salinity classes. (4) Thermodynamic analysis shows the influence of some minerals on water salinity. The compilation of all the data allows the determination of the origin of the observed water salinity. The results are shown on the general salinity map and indicate the influence of each factor cited above.

Keywords: Salinity - ACP - Thermodynamics - Stuyfzand - Algeria

222 - FIRST APPROACH OF THE ECOHYDROLOGICAL RESEARCHES AT A REGIONAL SCALE IN BANAT HYDROGRAPHICAL AREA

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The paper has as background the study of the heavily modified water bodies rehabilitation that started with the Water Framework Directive 60/2000/EEC recommendations and was completed by personal research.

First there are presented the heavily modified water bodies rehabilitation measures and the techniques required for an efficient implementation. Then it is detailed the method used for the prioritization and selection of the rehabilitation measures at the regional scale with focus on an expert-system, a tool which was created to be applied for the Dutch lowlands, but with some extra work and calibration it was used also for the highlands of Banat.

Keywords: heavily modified water bodies (HMWB), rehabilitation, efficiency, cost-effectiveness, prioritization

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233 - A METHODOLOGICAL APPROACH TO QUANTIFY THE EFFECT OF FLOW VARIABILITY ON AQUATIC POPULATION DYNAMICS

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Ecohydrological management principle relies on the controlling effect of water flux and related energy and nutrient fluxes on biotic processes taking place at the basin scale. We focus here on water courses ecosystems. Biotic data from streams are often scarce over time and space.

Conversely, flow data are continuous time series quite well spread along water courses. Biotic - abiotic model building, for impact assessment or management

purpose, requires mathematical links between biotic index values and corresponding habitat conditions. However, giving the fact that living species can integrate past habitat conditions in their behaviour, correlations with instant habitat flow data from the sampling moment are not adapted. This limit was addressed developing a computer routine to calculate a series of antecedent flow characteristics into incremented periods backwards from biotic sampling dates. It allows to select regulating hydrological indices and to quantify the time of response and duration of effect of these water flux characteristics on the biota.

At the same time we must consider that biotic dynamics is also controlled by various factors like predation, competition, fertility and mortality, live span cycle, all resulting in an intrinsic biotic dynamics. The "S" shape Gompertz model was retained to simulate the natural growth process (Gompertz 1852).

In this study we test the hypothesis that water flux variability can enhance or reduce the natural biotic dynamics. To do so we combined the natural -undisturbed- growth model with the temporal evolution of selected hydrological indices. We use for the purpose discharge time series and data sets for macrophytes and invertebrates.

Resistance and resilience characteristics of each species are discussed in terms of water management perspectives.

234- CLIMATE CHANGE IMPACT ON SURFACE WATER QUALITY IN THE REPUBLIC OF MACEDONIA

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Climate change can affect the water quality aspect in three manners:

a) reduced hydrological resources may leave less dilution flow in the river, leading to degraded water quality or increased investments in wastewater treatment,

b) higher temperatures reduce dissolved oxygen content in water bodies and

c) in response to climate change, water uses, especially those for agriculture, may increase the concentration of pollution being released to the rivers.

Generally, current condition of the water quality for the most of the surface water in the Republic of Macedonia is not satisfying the legal requirements. Main polluter is the urban wastewater, which is discharged directly into the rivers and streams without treatment, then wastewater from industry as well as from animal farms. The largest cities do not have wastewater treatment plants and also industries do not treat the wastewater. Additionally, there are diffuse sources of water pollution coming from agricultural use of the nitrate fertilizers (chemical and organic).

The objective of this paper is to assess the impact of the climate change on the river water quality in the Republic of Macedonia. In order to analyze the climate change impact on the water quality, the data from the monitoring of the water quality of river Vardar at sample point Skopje and Demir Kapija for the period 1999-2005 are processed. The parameters of interest are: water temperature, dissolved oxygen, Nitrogen Ammonia, Nitrogen Nitrite, Nitrogen Nitrate and Phosphate. The attempt was made to make a functional dependence of the listed parameters with the river discharges, actually to analyze the impact of the reduced discharge (as a result of the climate change) on the water quality.

For all listed parameters historical diagrams are produced in relation with the discharges. Also, the dependences between the parameters and the discharges are analyzed and the trend lines are defined. Finally, the pollution load per a year from four nutrients is estimated. As a result of the performed analyses, several conclusions were made that confirmed that the climate change, beside on the quantities, have also negative impact on the river water quality. The defined dependence of the: temperatures, dissolved Oxygen, Nitrogen Ammonia and Nitrogen Nitrite on discharges are more expressed for the lower discharges. The negative impact of these parameters would affect more the water quality in the conditions of the climate change.

Keywords: climate change, water quality, pollution load

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241 - THE GUARANTEE OF THE DRINKING WATER FOR THE DURRESI ZONE, THROUGH THE FUSHE KUQE AND ELBASAN UNDERGROUND WATER BEARING BASINS

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The above objective realizes conform the period on disposal and the complex compose of the study group according to the objectives, combining the complexity

of the differ works, concentrating on three main aspects, according to them derives the finally design of the report. The first aspect is related to the methodology, the studies and works made before and with the kind of the observations and complex works. The second aspect (the supporting part of the study) is related to geological and geo - environmental treatment of this issue.

The thirst aspect (the special part of the study), which includes all concrete processes of the included activity in implementation of this project (the work organizing, the gathering of the information, complexity and the differ observations, essential hydro geological features, aquifers, the source and drain zones, capacity, quality, dynamism, the possibility of the utilization, geo-economic and geo-environmental problems, the information, protection measures, prevent measures and the progress for the future).

From the technical procedure, all the work is focused with: the gathering of the all documentation, preliminary process and the estimation of the dates compare, the beginning of the field work, for the maps of the observation and the date base, the preliminary observation to control in situ the complementary dates, which are taken preliminary, to have a general panorama at first about all the territory, the operate strategy, the norms of the realization of the all observations and the dates elaborate, the date base, which need to support the conservation, the presentation of the undertaken solves from the underground water models, the field period as the most important for the gathering of the new information, the construction of the maps and the elaborate of the dates including computering process and the digitalizing, the final report, according to the arrived results conform to the project, the realization of the objectives after the finance scale.

In the same time, to do more concrete and effective, the way of the presentation for the local power, community and media, must to prepare the abbreviations for all the units, whose activity is related directly to the water basins territories.

After the recent study dates, Albania is rich country with the many kinds underground water, which differ among them, according to the legislations of the gathering and distribution through very differ rocks, from the geneses and litholog-stratigraphical composition, so and the hydraulic character of the water bearing layers, for the very different hydro chemical and hydro dynamical conditions, which are conditioned from the geologic - structural and geomorphologic construction.

The free movement and the concentration of the population in western Adriatic lowland, fortunately is in right proportion to increasing of the water quantity for these territories. It means that the most of the quantities of the water there are in Adriatic lowland, in the alluvium fields of the lower flows of the main Adriatic basin rivers. But, actually the presence of these waters as a national resource, is threaded and protected from without criterions utilization, in the basins and also in their furnishing and depositing units (rivers, lakes etc.). Actually for these basins, which are a lot of ones, (Buna, Drini-Mat-Ishmi, Erzeni and Shkumbini - Semani - Vjosa), there are adequate dates for the geological position, reserves

also for the their quality, but has not the models to study their situation in dynamic, to give rations the between the utilization possibilities and productivity ones after the supply from the rains and other sources.These water basins and rivers as main supplies of them are complicated and dependent from the exo-endogene agents, also from the human activity. Except the its well contribute in many cases the human produce the direct and indirect troubles for the well managements of these reserves as resources. Seeing in this aspect the man as conscientious one understands his role in the management of these resources and undertakes the studies for the actual conditions, consider the past and programs the future, because that everything is in its favor, putting the clear rules for the cooperation.

256 - NEGATIVE EFFECTS OF EXTRA WATER ON THE PHYSICAL, CHEMICAL AND MICROBIOLOGICAL SOIL PROPERTIES

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Hydro-pedologyc report, together with the most important physic, chemic and microbiologic water results and analyses, are resources of main information related to negative effects of poor drainage in reclamation soil properties. Different practices, researches related to soil properties, describe main practices related to technical indicators of solving drainage issues.

The main selected indicator is electrical conductivity of the water extract (EC, dS/m in 250 °C). The value of EC is increasing in the soil without drainage and bare lands every year. Values of EC from measurements in Saver (Lushnje) are 5.2 dS/m to 6.5 dS/m, that shows high concentration degree of salt in the soil.

Also is determined ESP or percent of natrium exchange capacity versus cation exchanged capacity. Under different studies has resulted very high ESP values form 17.5% in Saver to 19.6% in Kakarriq, that shows a high degree of alkalinity, form the increasing of natrium exchange capacity. Degradation of the soil as a lack of drainage process and not using it for agriculture, is observed also from low values of permeability that are 1.1 mm/h to 2.5 mm/h.

Results of underground water during wetted time (October-April) varies 40 to 60 cm. Average for this period are: 62 cm in Saver (Lushnje), 56 cm in Trush (Shkoder), 60 cm in Vrine (Sarande) and 42 cm in Kakariq (Lezhe), which are indicators for lack of drainage or bad drainage management. In different days,

these values have been lower as 20 cm in Trush, or water has reached surface in Kakariq (during December).

Lack of drainage is manifested also in the poor microbiologic activity. This is observed from the rapport of nitrification bacteria and denitrification bacteria, this case is in favour of denitrification bacteria. It is dominant also fungi Micelia steril, that is indicator of salt increasing in the not drained soils.

Results of studies show that in melioration soils is increased or developed process of wetland (Kakariq, Torrovice, Terbuf, Roskovec, Maliq, Vrine), it is increased salt concentration also in other normal soils (Saver, Trush). This leads to the sodicity of salted soils and degradation of consideration surfaces.

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258 - THE ANALYSIS OF THE SOLID DISCHARGE OVER THE LAST THREE DECADES IN THE ROMANIAN SECTOR OF THE DANUBE

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The paper is based on an analysis of the evolution in time regarding the sediment discharge in the lower section of the Danube River, between Bazias and Isaccea.

The study aims at three objectives: the first one - assessment of total sediment discharge and the assessment of the second component, the bed-load discharge (a component which has not been yet taken into account in the sediment balance calculations), the second objective - the assessment of the influence that the hydroenergetic structures located on the Danube itself, but also on its tributaries, have upon the sediment discharge over the last three decades (1970-2006), the third objective is the percentual evaluation of the repartition regarding the solid suspension outflow on the main branches of the Danube River.

Keywords: sediment runoff, global sediment discharge, percentage repartition of the sediment run-off.

261 - IMPACT OF AGRICULTURE ON GROUNDWATER QUALITY IN THE OGOSTA RIVER BASIN, BULGARIA

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The watershed of in the Ogosta river is well known agricultural region, both for plant growing and stock-breeding. Groundwater is under impact of agricultural and industrial activities and old mining pollution in the upper part of the watershed. At the same time, groundwater is widely used for local water supply of numerous villages.

The data on groundwater quality in the region show increased level of nitrate content over the ecological threshold, sometimes over the pollution threshold (according to the Bulgarian Regulation - 1 for research, utilization and protection of groundwater). Some stations have registered enhanced level of phosphates and ammonium.

Excess application of fertilizers and livestock wastes are supposed to be the main causes of increased nitrate content in groundwater.

The region has various geological and geological settings in its different parts. For the purposes of groundwater management it is important to delineate zones where groundwater is more vulnerable to pollution.

Keywords: groundwater quality, pollution, nitrates, vulnerability, repartition of the sediment run-off.

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264 - PARASITOLOGICAL CHARACTERIZATION OF WASTEWATERS OF THE OLD MEDINA (EL MELLAH) AND PROVINCIAL HOSPITAL AL IDRISSI, KENITRA (MOROCCO)

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This study focused on the analysis parasitological raw sewage from both collectors sewage (D and X) from the city of Kénitra (Morocco). The main objective of

this study is the determination of parasitic species present in the raw sewage which human and animal populations can be exposed at the wastewater reuse in agriculture. The technique of concentration used for the detection of eggs Helminths in wastewater is one of BAILENGER.

Monitoring parasitological wastewater shows that these waters are contaminated with the eggs of helminth parasites with a mean concentration of 11.4 eggs / l at the collector D and 9.23 eggs / l at the collector X.

The mean concentrations of parasites are now 9.9 eggs / l for Ascaris sp., 0.8 eggs / l for Enterobius vermicularis and 0.7 eggs / l for Hymenolepis nana at the collector D. While at the level of the collector X, their average concentrations of 7,5 eggs / l for Ascaris sp., 0.62 eggs / l for Enterobius vermicularis, 0.75 eggs / l for Hymenolepis nana., 0.37 eggs / l for Fasciola sp.

Concentrations found helminth eggs have largely exceeded the standards accepted by the WHO (1991) and CNS (1994). Therefore, these waters should in no way be reused for irrigation of crops and even rejected in the oued Sebou without prior treatment, as is unfortunately the case yet.

Keywords: Wastewater Crude, Oued Sebou, helminth, Kénitra, Morocco.

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266 - TRANSBOUNDARY RIVERS OF RUSSIA, KAZAKHSTAN AND CAUCASUS: RADIATION, HYDRO-CHEMICAL SITUATIONS AND RISKS

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Intensive and insufficiently controlled human industrial activities, ignoring regional geological and geochemical processes, resulted in considerable chemical pollution and radioactive contamination of the largest river's basins in East Europe and Central Asia, where many large nuclear power plants, uranium, heavy industrial and chemical enterprises, metal and mineral ore extractions, oil and gas productions are also located. The epidemiological and environmental situation here aggravated further after USSR collapse and the establishment of new independent states, due to lack of the appropriate environmental monitoring at their territories and in particular at their near-border areas, that contributed to further aggravation of the political tension and economic destabilization between transboundary countries. Today this situation is one of most unfavorable among all world water ecosystems. Here we pay attention to the water basins of the largest Russian-Kazakhstan - Caucasus transboundary rivers: Volga, Ural, Araks and Kura, flowed into Caspian Sea, Irtysh, flowed into Ob river and then in Arctic Ocean. In recent years different pollutants (radionuclides, toxins, organic substances and heavy metals) activate reduction processes in bottom sediments, that lead to changes in sulfur and carbon cycles, the oxygen deficit in water, to eutrophication of water reservoirs and their biological degradation. That is why the development of total environmental monitoring systems is clearly necessary for operative current control, assessments of radiological and chemical risks under possible natural and man-made catastrophes, risk and water resources managements, ensuring preparedness and prediction of any potential emergencies of global and local scales and their long-term effects. Some thematic results, obtained on our International Programs, are under consideration. They promote the realization of concept of substantial development with growth of economical cooperation and stability, decreasing of political stress at global scale for all countries, located at Euro-Asian Continent.

Keywords: River's Basins, Chemical and Radioactive Pollution, Monitoring Systems, Risk and Water Resources Management, Substantial Development

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267 - WATER QUALITY AND ARSENIC POLLUTION IN GROUNDWATER OF BANGLADESH

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The scientists of Rajshahi University together with Hokkaido University, Research Group for Applied Geology (RGAG) and Asian Arsenic Network (AAN)

of Japan suspect that groundwater of about 60 out of 64 districts are seriously contaminated with arsenic. There are 11 Million tube wells in Bangladesh, of which about 5 Million tube wells are highly arsenic contaminated. About 75 Million people of the affected districts are at risk, with 7000 reported patients suffering from Arsenicosis, of which about 200 died in the last few years. It is very much essential to arrange safe water supply for the peoples. To give safe arsenic free water to the people more investigations in the whole country is essential. The source of arsenic in groundwater of Bangladesh is as yet unknown. But it is now widely believed that the high arsenic levels in the groundwater in Bangladesh have a natural geological source which may be due to heavy abstraction of water from deltaic aquifers. In Bangladesh Groundwater from sandy alluvial deposits are considered to be arsenic free. It is essential to consider the groundwater occurrences, its distribution and geological and hydro geological settings of the country for the mitigation of arsenic problem. To know the basic understanding of the source and mobility of arsenic it is essential to investigate the sampling depth and aquifer provenance. Present study will give some clue about the future action plan for the mitigation of the arsenic problem in Bangladesh. Variation of heart disease mortality have a general relationship with the relative hardness of drinking water.

Priority should be given for the mitigation of arsenic problem in Bangladesh and give people access to arsenic free water. If precautionary measures against arsenic contamination are not taken immediately, consequences like death of many people will be inevitable and massive. Raising awareness about the issue among the people should be the first step for precaution. It is also very important to know the mechanism of arsenic contamination in groundwater. Essential to find out the exact and possible sources of arsenic in the groundwater in the arsenic affected areas of the whole country. Surface water such as ponds, lake, river can be used as a source of drinking water after boiling it. Rain water can be another safe source of drinking water. Sophisticated laboratory facilities should be developed to detect arsenic concentration in tube well water as well as that in human body. Not to jump from one local explanation to a nation wide or basin wise explanation because there is no reason to think that these answer's will be applicable in all cases. Arrange to supply arsenic free drinking water because safe water is the best medicine for the people of the arsenic poisoning areas of the country.

Keywords : Aquifer Provenance, Arsenic, Contamination, Groundwater, Hydro geological Settings. Geo-chemical Occurrence.

269 - HUMAN-INDUCED WETLAND DEGRADATION: A CASE STUDY OF AMIK LAKE (SOUTHERN TURKEY)

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Turkey has more than 250 wetlands covering a total area of approximately 1 million ha. 63 wetlands are of prime importance, among which the former Amik Lake exists. Even though over 1,3 million ha lands (totally 57%) have been disappeared as a consequence of wetland desiccation, significant efforts were attempted for prevention the decrease in areas of wetlands during the past 15 years. The desiccation of Turkey's wetlands results from various causes, such as agriculture activities, growth in industrial and residential areas, road constructions, malaria eradication and flood prevention etc. Nevertheless, these human interferences has caused crucial environmental degradations.

The former Amik Lake's wetland, which had a total area of 31000 ha in 1950's prior to desiccation works, is a dramatic example of degraded wetlands in Turkey. The area is located in one of the main routes of migratory birds. In fact, approximately half million birds follow the Amik lake migration route.

The initial cause of wetland desiccation in the area has been caused by the first attempt for cultivation of cotton in early 1940's. However, despite the whole high-cost projects carried out to drain this wetland during the last 60 years, desiccation works failed except the success in the decrease of the number of malaria cases. As a matter of fact, serious unexpected results occured, such as low productivity and salinity in newly obtained farming lands, failure in flood fight, resultant increase in poverty of low-income farmers and disappearence of wetland habitat in the area. In addition, severe deteriorations that took place in water quality and balance of the area has also simultaneously annihilated living wetland organisms.

In this study, recent status of wetlands in Turkey and environmental, ecological and economical problems encountered in and around the recently desiccated Amik Lake, one of the most significant wetlands of Turkey, are discussed. Our results reveal that human interference in wetlands may give rise to serious adverse effects on natural life cycle and local welfare. Thus, "the experience of Amik Lake" which is a remerkable example to degraded wetlands, proves both the non-recyclable damages caused by human interference and deficiency of technological applications in such environments.

Keywords: Wetlands, Desiccation, Migratory birds, Amik Lake, Turkey

278 - SOLID WASTE MANAGEMENT IN INDIA: ENVIRONMENT STATUS AND RISK

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Although nothing is waste in world but its utility and economy is deciding the fate of refuse and called waste. Solid waste comprises all the wastes arising from human and animal activities that are normally solid and discarded as useless or unwanted matter. Solid waste management involves various activities like collection, storage, transportation, and disposed of refused material. Where intense human activities concentrate, such as in urban centers, appropriate and safe solid waste management are of utmost importance to allow healthy living conditions for the population. In case of the biomedical waste which is originated from hospitals, nursing homes and clinics continue to dump in open garbage bins. Waste disposal creates serious environmental problems and if the activities are not properly controlled and precautionary measures are not adopted, there may have adverse environmental impact on land, water, air & health and also cause serious economic and other welfare losses.

Keywords: Biomedical waste, Contamination, Solid waste management.

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281 - ASSESSMENT OF AGRICULTURAL NUTRIENT BALANCES FOR THE LESNOVSKA RIVER WATERSHED

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The nitrogen and phosphorus surpluses resulting from agricultural activities are one of reasons for enrichment of groundwater and inland waters with these nutrients. This enrichment causes water pollution and the eutrophication of the surface waters. The objective of this paper is to present results for annual agricultural nutrient balances developed for one Bulgarian River watershed, that of the Lesnovska river for long period from 1958 till 2000. The results are

obtained in the process of development of the project "Nutrient Management in the Danube Basin and its Impact on the Black Sea" (daNUbs), funded under the 5th EU Framework Programme for research and technological development. The balances are calculated as soil surface nutrient balances using the OECD methodology. According this methodology the soil surface balance is the difference between the total quantity of nutrient inputs entering the soil situated in an agricultural land use area and the nutrient outgoing quantity leaving the soil annually. The balance calculation are based on statistical data related to the district level (EU NUTS Level 3) for number of live animals of different kinds and ages (calves, cattle, sows, fattening pigs and so on), harvested crop production, forage production, seeds and planting materials, area of legume crops, consumption of mineral fertilizers and for agricultural land use area and on the nutrient equivalent coefficients. The results for the nutrient surplus for the Lesnovska River watershed for the period 1958-2000 are deduced on the calculated nutrient balance results for the two districts in Bulgaria, Sofia-grad and Sofia oblast and the proportion of catchment agricultural area embraced by each of them.

Keywords: Bulgarian River basin, Lesnovska River watershed, surface nutrient balances, water pollution

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284 - PHYSICO-CHEMICAL AND MICROBIOLOGICAL ANALYSIS OF DRINKING WATER SPRINGING FROM LUKAR AND RIVER CRNA REKA

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Citizens of Kavadarci along with ten local villages and the town of Negotino have got drinking water which springs from 'Lukar' through integrated piped water supplying system, maintained and controlled from Public Communal Sanitary Inspectorate. External control quality of drinking water, as well as the water from the river Crna Reka including the Tikvesh Lake, is performed by the Public Health Institute for Health Protection Veles, Local Unit Kavadarci. Several physicochemical and microbiological drinking water analyses were conducted in this research from six different locations in the town on 8.10.2007 and on five different locations from the river Crna Reka throughout 2007. The analysis of the samples had been done in the microbiological and sanitary-toxicological laboratory in accordance with general and special water regulations estimated

by Drinking Water Protection Health Community of the Republic of Macedonia. The level of physicochemical drinking water quality meets the requirements completely and bacteriological contamination is not detected.

In the waters of the river Crna Reka have been counted total aerobic organotrophic bacteria determined on nutritive agar, proteolitic on MPA with gelatine, amilolytic on MPA with starch and lipolytic with tributyrrine. The most probable number of coliforms was determined on PWLAI, endoagar, liquid EC base, solid Mac Conkey agar base and IMVC test, faecal coliforms on Mac Conkey bouyon, faecal streptococcus with MPN method, on KAA agar, on M-Enterococcus agar, KF-Streptococcus agar and MF-method with katalaza test, Escherichia coli with Erkman test, Pseudomonas aeroginosa on KING base, MPN and MF method, Proteus sp. on blood agar, endoagar and identifications with IMVC biochemical methods; sulphate reducing sporogenic anaerobes on sulphate and blood agar for Clostridium perfrigens.

Physico-chemical parameters determined the used quantity of $KMnO_4$ with titration by Kubbl-Tieman, residual chlorine-colorimetric method with O-tolidin, chlorides with argentometric titration by Mohr, residual mineral materials after evaporation at 105 °C, the temperature- thermometrical, pH and electroconducting-electrometrical, the colour with Hellige comparator, NH_3-colourimetrically with KNa-tartarat and Nessler reagents, nitrites-colourimetrical with sulfanil acid, nitrates- colourimetrical with brucin, iron and mangan with AAS Perkin Elmer, clarity with descriptive method and odour and taste-organoleptically.

All the analysis conducted in this research showed a high level of appropriation with the general and special rools estimated by drinking water protection Health Community.

Keywords: Drinking water, physico-chemical and microbiological analysis.

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288 - A RESEARCH ON DETERMINATION OF HABITAT QUALITY OF RUNNING WATERS OF WESTERN BLACK SEA REGION USING BY BENTHIC MACROINVERTEBRATE FAUNA

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In this study, benthic macroinvertebrate fauna of running waters of Western Black Sea Region was studied in Düzce, Bolu, Karabük, Kastamonu and Sinop.

Physicochemical variables and biological data were collected from various running water ecosystems in this region. The benthic macroinvertebrate samples consisted of 7 classes which were Platyhelminthes, Gastropoda, Bivalvia, Oligochaeta, Arachnida, Malacostraca and Insecta. Benthic macroinvertebrates in various taxonomic levels were used in determination of water quality.

The relationships between macroinvertebrate assemblages and some environmental variables were explored by various statistical analysis and indices. The Shannon diversity index, frequency, dominance and similarity index was used for the numerical analysis of benthic macroinvertebrates. According to physico-chemical variables, biotic index, diversity index and number of EPT taxa, collection sites were detected non-polluted, slightly polluted, moderately polluted and polluted.

Keywords: aquaic ecosystem, biomonitoring, benthic macroinvertebrates, Western Black Sea Region, physical-chemical variables, habitat quality.

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295 - ENERGY SPECTRA STUDY OF NATURAL WATERS

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The energy spectrum of water, which by definition is the energy distribution of Hydrogen bonds in the water probe, is sensitive to chemical ingredients and physical interactions. It reflects the integral environmental influence on natural waters. We discuss the method of measurement and characteristics of the spectrum as well as some examples of spectra of natural waters.

Keywords: Energy spectrum of water, Hydrogen bonds, Natural waters, Environmental influence.

296 - ON HYDROGEN BOND DYNAMICS FOR EVAPORATING DROPS

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An evaporating water drop situated on a substrate is considered. A system of differential equations is given describing the time evolution of two types of water molecules: free and bounded by Hydrogen bonds. A computer solution of the system is given. Consistency with the model of a priory chosen transition rates between the two types of molecules can be checked on the basis of the computer solution.

Keywords: Drop evaporation, Hydrogen bonds, Differential equations, Transition rates.

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302 - QUALITY OF DRINKING WATER IN SOME VILLAGES IN MOUNTAIN SHARR AND TETOVO CITY, COMPARED WITH WATER QUALITY OF CITY AQUEDUCT

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In this study we are presenting some results of sanitary estimation, to mark the healthy aspects of drinking water from water supply systems in some villages of Shara Mountain of Tetovo, city of Tetovo and compare physic-chemical parameters with waters of Pena River . We have had the aim to evaluate the quality of drinking water and the effect of the quality of water toward the health of inhabitants of this region.

Results of our measure are of autumn 2007 period, and those of water are of the same time period of 2002 year. We have measured some physic-chemical parameters and some bacteriological parameters based on modern methodology (Official Gazette of R. Macedonia No. 57/04) which is in coordination with European regulative.

On actual science knowledge is known that the quality of water of aqueduct of villages in some cases in microbiological aspect and for some physical-chemical parameters are unsatisfied. We think that the results of our study verify this information and at the same time we want to give our science and professional opinion for overcoming of this situation very important for community health.

Keywords: quality, drinking water, river water, Mountain Sharr villages, Macedonia

303 - THE PHYSICAL, PHYSICAL-CHEMICAL AND CHEMICAL PARAMETERS DETERMINATION OF RIVER WATER SHKUMBINI (PENA) (PART A)

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In this paper are determinate some physicals, physical-chemical and chemical parameters of river water Pena to determinate the rate level of pollution. The parameters are measure in four samples-places in the period January-June 2002 and conclude about influence of pollution in the water Ecosystem such as about precaution (stimate) for his protectingly. From results we can summarize that the river water is of first class for lot of parameters, which for moment present satisfactory ecological situation of the river water, that may be use for economical activity, for irrigation, for recreation and for swimming.

Keywords: surface water, quality of water, river, physical-chemical parameters, spectrometric analysis, potentiometric stripping analysis (PSA), atomic absorption spectroscopy (AAS).

305 - HYDROGEOLOGICAL CONSIDERATIONS IN ARGES COUNTY

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The research made in the study area emphasized the presence of groundwater in the entire Arges County, but in different quantitative and qualitative conditions depending on the local geomorphological and geological characteristics.

The hydrogeological exploration or exploitation wells executed in the study area showed the existence of two aquifers: phreatic and deep.

The most important aquifers are located in Upper Romanian - Quaternary deposits and are mainly developed in the southern area of the Curtea de Arges locality.

The paper presents several geological, hydrogeological and hydrochemical general considerations and a detailed analysis regarding the piezometric level variations and the nitrates contents in the phreatic aquifer from the Arges county.

Keywords: phreatic aquifer, deep aquifer, piezometric level, nitrates contents

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309 - ECOLOGICAL EVALUATION OF WATERWAYS IN THE RIVER UNA BASIN

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The Una river basin is situated in the NW of Bosnia and Herzegovina in karstic region. The upper course of the Una river is distinguished by very high biodiversity level. Suitable ecological conditions have enabled development of specific aquatic ecosystems which makes this area one of the richest regions in the Dinaric Alps. For these reasons, this area should be designated as IUCN category II protected area - National park Unfortunatelly, this area has been exposed to the unsustainable human activities for a long period.

Qualitative and quantitative compostion of living communities which make phytobenthos, macroinivertebrates, and ichthyofauna are suitable indicators

of current conditions and potential biological modifications in the environment on the long term scale. While results of physical and chemical analysis give an overview of the situation in the period of sampling, saprobic index gives important information and insight for a longer time scale.

In order to prevent future negative impacts and deterioration of these valuable ecosystems it would be necessary to establish ecological monitoring program in the river Una basin using.

In the paper are presented results of ecological investigations carried out in the last five years (2002-2007), together with mitigation measures. All results are processed in ArcGIS in order to obtain detailed maps of ecological status of the waterways in the river Una Basin.

Keywords: river Una, watershed analysis, living communities, saprobic index, ArcGIS

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311 - RAPID ASSESSMENT OF FRESHWATER MACROZOOBENTHOS ASSEMBLAGES ON A WESTERN AEGEAN ISLAND (EUBOEA, GREECE)

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A rapid assessment method was employed in surveying the macrozoobenthos of natural freshwaters in the southern part of the Euboea island, Greece. This presentation discusses the suitability of certain macrozoobenthos assemblages (water mites, aquatic beetles, leeches and aquatic molluscs) as biological indicators for use in the conservation evaluation of freshwater habitat areas in and around the Mount Ochi Protected Area on Euboea Island (38° 05' N 24° 28' E). To this end, 19 localities were sampled to compile species compositions, and to examine their relation with different morphometric and trophic status parameters. The approach taken builds a snap-shot survey that provides a preliminary conservation-relevant inventory. The Mount Ochi Protected Area of Euboea proves to have a remarkable variety of small freshwater habitats characterized by ten major streams, with many kilometers of perennial flow, a situation of unique

conservation value in the seasonally semi-arid region of the western Aegean. Apart from the large number of lotic habitats, small spring-fed ponds, spring-fed marshes, artificial ponds and lagoon-like river mouths where also surveyed. These small and vulnerable wetland habitats host a distinctive macrozoobenthic fauna, including several endemic species.

Keywords: Macrozoobenthos, rapid assessment, bioindicators, Euboea Island, Greece

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315 - SITUATION OF MACROINVERTEBRATES OF VJOSA RIVER - ALBANIA, AND THEIR RELATIONSHIPS WITH WATER QUALITY AND ENVIRONMENTAL STATE

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A survey of benthic macroinvertebrates has been carried out in Vjosa River and its two main tributaries, Drinos and Shushica rivers in October 2006. Species composition and quantitative characteristics of the macrozoobenthic community have been assessed. Existing data on variations of water level and chemical water analysis haven been used for assessing the characteristics of biotopes and water quality in the sampling areas of macroinvertebrates. A total of 49 taxa have been identified, whose distribution along the river shows an evident relation to the water level, water quality and biotope characteristics, in both species number and quantity of individuals. The highest quantitative variation has been recorded for the caddisfly Hydropsyche (Tricoptera), while for the variation of species number the highest value has been recorded for coleopters. The highest species number has been recorded in the tributaries, close to the connection with Vjosa, where it seems to have a higher variety of feeding behavior. The lowest species number has been recorded in the most polluted areas. The small number of constant species and the high number of occasional species is an indicator for an unfavorable situation of the macrozoobenthic community in Vjosa River. Since Vjosa has been considered as the cleanest among big rivers of Albania, this unfavorable situation of macroinvertebrates may be mostly influenced by the variations of water level, due to the drying up of a large area in the river sides during hot summer.

Keywords: benthic macroinvertebrates, Vjosa River, water level, water quality.

317 - ESTIMATION OF NITROGEN AND PHOSPHOROUS POLLUTION IN THE LESNOVSKA RIVER

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To provide reliable nutrient balances on catchment scale data precision was essential and that is why besides available data sets which the National Monitoring System in Bulgaria offers additional sampling programme in the Lesnovska River Basin was realized for the definite period, where nutrients were systematically analyzed. The sampling program was developed and performed in the Water Quality Laboratory to the "Problems of Water Resources Quality" department in the framework project "Nutrient Management in the Danube Basin and its Impact on the Black Sea" (daNUbs) funded by the 5-th Framework Program of EU.

The Lesnovska River is a third order tributary of the Danube River. It mouths into the Iskar River that flows into the Danube River. The catchment area of the Lesnovska River is 1100 km². The river is 19,8 km in length. The river basin comprises seven municipalities. Four of them belong to the Sofia City, the capital of Bulgaria and the rest are in the Sofia region county. The nitrogen emissions in the Lesnovska river basin is mainly from the slag tailing dam effluent formed by the Kremikovtzi metallurgy plant located in this area. The largest contribution to the phosphorus emissions is of erosion, followed by this of urban areas.

The determination of parameters: water quantity, temperature, pH, conductivity, dissolved oxygen, suspended solids, ammonium-nitrogen, nitrite-nitrogen, nitrate-nitrogen, and total nitrogen, ortho-phosphate-phosphorous, total phosphorous, and silica were performed in the period from October 2001 to November 2002. Some other parameters like oxygen saturation, TOC, chloride etc. that related to the Lesnovska River water pollution were also analyzed. The results of this study are presented in this paper. They are interpreted, discussed and illustrated. On the base the respective conclusions are made.

Keywords: Water pollution, Lesnovska River, nitrogen and phosphorous

318 - REGULATION OF THE KLINA RIVER-BED IN SKENDERAJ REGION

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In Skenderaj,in the district of Klina river, the European agency for reconstruction, has invested in the constructuin of the wastewater treatment plant. The plant site is exposed to floods induced by the Klina river, hence it is required to be taken protective meassures for protection of this plant from the negative effects induced by the floods. In this paper we present the studies made for regulation of Klina river and the ultimate solutions derived.

In order for successful solving of this issue, the study has been focused on three general items:

- Definition of general parameters of the watershed of Klina river. Based on these parameters, it has been determined the extreme river dischage for the site near the wastewater plant.
- Hydraulic design of the Klina riverbed in the district of the wastewater treatment plant. This issue was specifically considered by the authors. For the detailed design of the riverbed was applied the HEC RAS (Hydrologic Engineering Center - River Analisys System) software.
- Investigation of protection meassueres of River-banks due to erosion. Considering this issue, were given the necessary solution details for river-bed protection due to erosion. Initially it was considered the river-banks to be realised by implementation of gabions along the banks, however, by the preferences of the investors DBM (consortium from Germany in cooperation with Turkish companies) and with the acknowledgement of AER, the solution of the river-banks protection was made by aligned rocks.

Keywords: Klina river, river regulation, riverbed design, river analysis, gabions

320 - THE FORMING MECHANISM OF COMPLEX AQUIFER BASIN OF ELBASANI, ALBANIA

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The aquifer basin of Elbasani is a complex hydrogeological node of potent underground and surface drainage that pass through a gravel bed over 200 m thick. The waters of this gravel aquifer are exploited by many wells. The aquifer basin of Elbasani is organically linked with two elements: the gravel horizon and the Shkumbini River.

It extends along a sector of the Shkumbini River valley in central Albania. The aquifer is tightly related with early and recent developments occurring in this sector of the Shkumbini river valley.

The Aquifer Basin of Elbasani is related with the Elbasani-Dibra transversal fault that is one of the most important tectonic elements of the Albanides. Direct expression of this transversal fault is the Dumrea evaporite massif, east-west orientation of the Krasta tectonic sub-zone in this segment and the tectonic front of Shpati ultrabasic massif with the Krasta sub-zone formations.

The aquifer basin of Elbasani was formed during Pleistocene-Holocene. It is confined at the bottom by Pliocene-Quaternary deposits of the bedrock, whereas present day deposits represent the top of the section. The formation of five river terraces is documented in the vicinity of our area, testifying for the uplift regime during the Quaternary. However this uplift regime did not influence the area of the Elbasani Aquifer Basin because the local extensional regime was stronger than the regional uplift regime.

The Aquifer Basin of Elbasani represents a complex hydrogeological node; however its backbone is the quaternary gravel formation. In a simple and practical model the Elbasani aquifer basin can be described by the combination of two elements: the gravel horizon and the Shkumbini River (Fig. 5). The gravel horizon constitutes the storing tank and the filtering system. The Shkumbini River, passing through the gravel horizon plays the role of the water supplier, delineating so an aquifer of inexhaustible water reserves. The waters of Shkumbini River and of underground draining from Krasta and Mirdita tectonic zones recharge continuously the gravel horizon in the conditions of a completely filled tank. This is supported by data gained from experimental drillings, where despite the high discharge rates of 100 l/s, the difference between the static and dynamic level has been very small The construction of a landfill for the city of Elbasani, away from the aquifer basin as well as the construction of a line for the discharge

of sewage and other polluted waters in the westernmost side of the basin is required. The aquifer basin and the whole Shkumbini watershed must be placed under strict protective measures.

As conclusions; the Aquifer Basin of Elbasani is one of the largest water resources of Albania.The aquifer basin was formed in an extensional tectonic regime related with the activity of the Elbasani-Dibra transversal fault. The aquifer basin constitutes a complex hydrogeological node of potent surface and underground draining and thick gravel horizons.

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321 - THE EFFECT OF WATER QUALITY DISTURBANCES ON DISTRIBUTION OF PHYTOPLANKTON IN JAKARTA BAY - INDONESIA

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Jakarta Bay and Padang Coastal waters, are importance waters because they have many function which are a medium transportation at the sea as a port, source of livelihood for fishermen and also acts as a recreational as well as tourist attraction areas. The waters is being subject to various types of pollution arising from human activities, such as domestic and industrial effluent. Eventhough the country is marching towards prosperity, the environmental pollution as steadily increasing and has become a matter of public concern. The phytoplankton community composition, abundance, evenness and diversity along with various physical, chemical and biological parameters were assessed form two location that are Jakarta Bay and Padang Coastal waters. Indonesia.

The objective of the study was to investigate the distribution of the phytoplankton community within Jakarta Bay in order to identify the major sources of spatial distribution and ecological zones of Jakarta Bay. Results indicated highly significant differences between near shore and open sea in physical, chemical and biological parameters, particularly during the wet season and dry season.

Keywords: water quality, pollution, phytoplankton, distribution

324 - QUANTITATIVE MONITORING OF THE SETTLEMENT WASTE WATER IN REPUBLIC OF BULGARIA

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In connection with the recently acceptance of Republic Bulgaria in EU a large scale of Waste Water Treatment Plants (WWTP) are under planning and construction in the country. Their designing is faced to the necessity of realistic data about water regime and discharge of urban waste water that was not object for direct measurement and registration by now. The discharge measurement in the sewerage is a difficult action mainly because of the restricted access and hard polluted water flows with various mechanical and chemical substances.

In the Laboratory of Hydrometrics (Institute of Water Problems - Bulgarian Academy of Science) is developed and successfully applied in practice a methodology for permanent quantitative monitoring of urban waste water. In the presentation this experience is shared by examples of some successful realized measurement projects in the country. The study comprised information of measurement devices applied and experimental data about the waste water regime in the observed sewerage systems like twenty-four-hour observation of waste water discharge during the different year periods.

The implementation of this goal corresponds to the most effective practice for environment protection in the EU and it is an answer of one of the most unpopular engineering procedure in water economy.

Keywords: Waste water, Discharge, Measurement, Flow meter

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326 - EFFECTS OF WATER QUALITY ON MOBILIZATION OF HEAVY METALS IN THE MINING AREA

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Devastation of proctecting systems of surface water in the coal-mining area during the war, effected very much the water quality in the area. The study was conducted

aiming at investigating water contents of trace elements in the basin of the river Oskova (region Tuzla, B&H) affected by the open coal mine overburden. The water, sampled on 5 locations, were analysed on pH, turbidity, total suspended particles(TSP), conductivity, hardness, CO_2, alkalinity, acidity, COD, BOD, NO_2^-, NO_3^-, NH_4^+, Na^+, SO_4^{2-}, Fe, Mn, Ni, Cu, Cr, Pb, Cd, As, Zn and Hg, in the peropd of low, middle and high water flows.

It is showed that leachates inputed high amounts of different species, specially TSP, Fe, SO_4^{2-} and heavy metals. The changes of pH of input waters (lechates from overburden) and pH od surface water influenced mobility of all species, specially heavy metals, Fe and SO_4^{2-}.

Keywords: open coal mine overbuden, leachate, surface waters, pH, conductivity, heavy metals

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335 - RESULTS OF ZOOPLANKTON ANALYSIS OF THE SAVA RIVER

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Research results of zooplankton community of the Sava river on the territory of the Republic of Serbia are presented in this paper. Site research was carried out in the period of 21 to 25 August 2006 on 4 sites: Jamena, Sremska Mitrovica, Sabac i Ostruznica. On each of the sites samples were taken as per the cross section profile (left, center and right bank).

The samples for zooplankton were taken by hydrobiological bottle after Ruttner, the volume 4.5 dm^3 , and then filtered through plankton net. The total amount of 50 dm^3 of water was filtered for each sample.

The qualitative zooplankton analysis showed the presence of 42 taxa from 4 groups: Rotatoria, (29 taxa), Protozoa (8 taxa), Cladocera (2 taxa) and Copepoda. (3 taxa) Determination was made up to the level of species, higher taxonomic categories (genus) and lower taxonomic categories (forms and varieties). In qualitative aspect, Rotatoria group dominated, while the groups Protozoa, Cladocera and Copepoda were represented with considerably lower number of taxons. Quantitative analysis shows that the highest number of zooplanktons was found on the profile Sabac (left bank) where that value amounted to 107360 $ind.m^{-3}$, and smallest on the profile Jamena (left bank) 40320 $ind.m^{-3}$ The

highest participation in the total number of zooplanktons had the group Rotaroria, and a specie of this group Keratella cochlearis (GOSSE) was present in the highest numbers and it was found on all researched profiles. Group Protozoa was subdominant in the number of taxons and in total numbers and specie Arcella vulgaris (EHRB) i Difflugia limnetica (LEVANDER) were dominant within this group.

Keywords: the Sava River, zooplankton community, sample, analysis, location, qualitative analysis, quantitative analysis.

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336 - THE COMPOSITION AND BIOMASS OF PHYTOPLANKTON OF THE SAVA RIVER

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Sava river is the right-sided tributary of Danube river, which joins it at Belgrade. Sava flows through Serbia by its lower stretch that has all the characteristics of a plane river. Republic Hydrometeorological Service of Serbia and The Service For Environmental Protection of Serbia organized march-route water and sediment quality examination of this river from 21st until 25th August in 2006. This paper presents the results of analysis on phytoplankton community and physical-chemical water characteristics.

The results of physical-chemical water analysis, according to ICPDR classification, show that all examined parameters matched the first and the second class of water quality. Heterogenity of phytoplankton composition has been noted, 121 taxa from 7 algal divisions. The biggest heterogenity showed green algae (56 taxa). Diatoms were subdominant with 43 taxa. All other algal division were presented with small number of taxa: Cyanoprokaryota (9 taxa), Chrysophyta (2 taxa), Xanthophyta (2 taxa), Pyrrhophyta (2 taxa) - Euglenophyta (7 taxa).

The lower stretch of Sava river was characterized by the domination of centric diatoms: Stephanodiscus hantzschii Grun., Aulacoseira granulata (Ehrb.) Simonsen, Cyclotella meneghiniana Kützing and Skeletonema potamos (Weber) Hasle. The dominant representatives of green algae were the variations of species Pediastrum simplex Meyen and species of genera Scenedesmus Meyen. At Sabac site the increased numerosity of Cyanoprokaryota was noted, especially species Geitlerinema amphibi- (Agardh ex Gom.) Anagn.

The quantitative analysise pointed out on poverty of phytoplankton composition.

The smallest phytoplankton density was noted at Sremska Mitrovica in the middle of the river flow (36 800 ind. dm^{-3}), and the biggest at Ostruznica on the right side of the river (282 800 ind. dm^{-3}). At the same localities phyoplankton biomass was between minimal 33 µg dm^{-3} up to maximal 182 µg dm^{-3}. The concentration values of Chlorophyll a matched the oligothrophic status, that is characterized by the low primar production. According to ICPDR standard of classification these values matched the I class of water quality.

Keywords: phytoplankton, physical-chemical characteristics, algal biomass, Chlorophyll a.

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337 - QUALITATIVE COMPOSITION OF ICHTHYOFAUNA IN THE WATER-SHED IN REPUBLIC OF MACEDONIA

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The fresh waters of the Republic of Macedonia belong to the three water-sheds (water-shed of the River Crn Drim, water-shed of the River Vardar and water-shed of the River Strumica). The waters of the water-shed of the River Crn Drim flow into Adriatic Sea, whereas the waters of the water-shed of the Rivers Vardar and Strumica flow into Aegean Sea. Very small part of the waters from the R.Macedonia belongs to the water-shed of the River South Morava that belongs to the Danube water-shed which flow into Bleak Sea.

Thanks to the different conditions present in the different water-sheds, different geological periods of the water-shed-s genesis, different affects of the invasive ichthyological components from the surrounding regions mediate great differences of the qualitative composition of the ichthyological component in the borders of the Republic of Macedonia. Those have positive influence of the richness in the autochthonic fish population.

But, negative influence to the autochthony fish population-s biodiversity has the introduction of the new alochthonic species in the

water-sheds, what in the future can put in decrease or disappearance of the some representatives from the autochthonic fish fauna in the Republic of Macedonia.

Keywords: qualitative composition, ichtyofauna, water-shed, Republic of Macedonia

346 - A STUDY ON HEAVY METAL ACCUMULATION BY ASPHODELUS AESTIVUS L. TAXON AND PLANT AND SOIL TEXTURE FEATURES IN TUZLA AREA, CANAKKALE-TURKEY

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In this investigation, the botanical features and total heavy metal content of Asphodelus aestivus L. populations observed at two differents places in Tuzla Area are dealt with, which is distributed in different regions of Çanakkale in the northwestern part of Turkey. For this purpose, it was aimed at explaining ecological features of plant samples on the basis of chemical analyses carried out on soil and plant samples. Our analyses revealed several differences in terms of the total amounts of materials (B, Sr and Al) between the two study sites. From the plant structure analyses, Ba element was found to be absorbed more by plant.

Consequently, we tried to make some interpretations by comparing our data with ecological and present biologic properties.

Keywords: Heavy Metal, Asphodelus aestivus L, Tuzla Area, Çanakkale, Turkey.

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349 - PARASITOLOGICAL AND PHYSICOCHEMICAL CHARACTERIZATION OF RAW SEWAGE FROM THE CITY OF SIDI YAHIA OF GHARB

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The urban and industrial growth is the engine of development, but the pollution produced by industry, households and agriculture has long since passed the threshold of purification capacity with adverse consequences on the health and the environment. The wastewater from the urban commune of Sidi Yahia Gharb, are drained without treatment in the Oued Tiflet.

Our study focused on the physicochemical characterization of wastewater from the Sidi Yahia Gharb and the determination of parasitic species present in the raw

sewage which human and animal populations can be exposed at the wastewater reuse in agriculture. In our present study, we choose the collector B (Fig. 1), at the end of obtaining a representative on all the sewage drained by the people of Sidi Yahia. The raw sewage Sidi Yahia has pH close to neutral (7.52), a salinity of 0.81g / l, a conductivity 1.69mS/cm. The level of dissolved oxygen was 0.21mg / l, that of BOD5 of 159.11mg / l and a value of MES equal to 148 mg / l.

The results of the analysis of the collector parasitological studied are as follows (percentage of positive samples): Ascaris sp. (36.82%), Trichuris sp. (10.52%), Enterobius vermicularis (10.52%), Hookworm sp. (10.52%), Nematodirus sp. (21.05%) and Hymenolepis diminuta (10.52%).

In light of our results, we recommend a treatment advance of the raw sewage before discharge in the Oued Tiflet.

Keywords: raw sewage, physico-chemical, helminth eggs, Sidi Yahia Gharb

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359- FUNDAMENTAL PROBLEMS OF POLY METALS HERITAGE AND POLLUTION OF THE SOILS IN BALKAN COUNTRIES

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Ecology as interdisciplinary science has been getting more and more popularity in the XX century. Not infrequently Ecology becomes main factor for economical and political evolution of the people. Conservation of the environment is an important and general part of this science which study environment problems. This problem concerns to whole world and take up place priority in recent investigates.

In Balkan peninsula this question especially sharpens after Second World War in the result of industrial production. However, quite frequently industrial pollutions in Balkan countries are studied irregular without report geochemical anomalies and natural phenomenon.

Detail study of these questions attains through good knowledge of Geoecology. The aim of this article is to produce new evidences for Geoecologycal knowledge and to definite much better the science Geoecology.

Keywords: Balkan Geoecology, Historical reference, Basic stages, Geoecological anomalies, barriers and accumulations

360 - THE HETEROGENEOUS EQUILIBRIUM OF AL(III) ION WITH ASPARTIC ACID AND ASPARAGINE

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This paper examines the precipitation of Al (III) ion in water solutions of $AlCl_3$ (10 mM, 5 mM and 3 mM) with aspartic acid and asparagine (100 mM, 10 mM and 1 mM) in constant ionic strength of 0,6 M NaCl. The region of concentrations are found clearer solutions and also where the solid phase is presented is determined. Solid phase is analyzed by means of elementary chemical analysis, IR spectroscopy and x-ray diffraction. The isolated compounds are:

Al(III) - Aspartic acid $Al_4(OH)_8[OOCCHNH2CH2COO]_2 - 4H_2O$

Al(III) - asparagine $Al_4(OH)_{11}(OOCCHNH_2CH_2CONH_2)$

The product of solvability of isolated compounds can be approximately calculated in the solid phases, which is of great importance to better understand the distribution of aluminum in earth and in water.

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365 - SAFETY OF DRINKING WATER IN VOJVODINA

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The objective of the paper is to determine safety of drinking water in Vojvodina in the Republic of Serbia. The purpose of safety of water is to protect human

health. In the Republic of Serbia there are defined three different types of water for human consumption by national standard. Those types of water are regard to totaly treated and disinfected water, only disinfected water and untreated and undisinfected water. During 2006 in Vojvodina there were microbiologicaly analyzed 31855 samples of water and chemicaly analyzed 20982 samples of water. Microbiological contamination was proved in 6 668 (20,93%) samples of water, among which 492 (4,29%) were samples of totaly treated and disinfected water, 5025 (28,49%) were samples of only disinfected water and 1151 (41,93%) were samples of untreated and undisinfected water. There were not found controled pathogens bacteria (Salmonella spp., Shigella spp.). The most frequent microbiological health hazard found in all three types of water were total coliform bacteria. Chemical contamination was proved in 10951 (52,19%) samples of water, among which 1579 (16,03%) were samples of totaly treated and disinfected water, 7363 (83,86%) were samples of only disinfected water and 2009 (85,38%) were samples of untreated and undisinfected water. The most frequent chemical health hazard found in all three types of water were nitrite, arsenic and phosphate. This paper suggests that in Vojvodina safety of drinking water is unudequate due to microbiological as well as chemical safety.

Keywords: water, microorganisms, arsen, health, hazard

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367 - INNOVATIVE ECOMATERIALS AND TECHNOLOGY FOR WASTE WATERS PURIFICATION

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In this research we developed high quality carbon based adsorbents (SBET: 700-900 m^2/g) by the recycling of vegetal wastes from industrial and agricultural processing, which are similar or higher than some commercial activated carbons. The adsorbents characteristics are determined by the wastes origin and low inorganic content and the manufacturing parameters during carbonization and activation steps. The new ecoproducts prove a porous structure developed mainly

of micropores giving good adsorptive properties.

We describe the possible utilization of carbon based adsorbents on removing organic compounds and heavy metals from some polluted waters. In order to determine their adsorption efficiency towards water pollutants, the work has been done in static and dynamic conditions, using as liquid effluent aqueous solutions which contain aromatic hydrocarbons BTX (benzene, toluene, xylene) and phenol. The determination of the components concentration from the initial solution and after static/dynamic adsorption has been realised by UV-vis spectrofotometer and gas-chromatography analysis.

The results obtained show that all the analyzed samples present very good adsorption characteristics towards the existent organic pollutants. The adsorption efficiencies (>90%) depend on the type and characteristics of the adsorbent, the type of dissolved organic pollutants, the contact time and the adsorbent weight.

High adsorption efficiencies of carbon adsorbents made of soft lignocellulosic materials towards heavy metals (Cr^{6+}) from tannery waste water, have been obtained as well. The results will be improved by integrating the adsorbents in a purification filtering system which will be in accordance to the EU policies.

Keywords: Adsorbent, Purification, Waste waters, Organic compounds, Heavy metals

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375 - DETERMINING THE COEFFICIENTS OF FILTRATION DISPERSION IN ANISOTROPIC HOMOGENEOUS POROUS MEDIUM

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The aim of this work is to present a method for determining the tensor of dispersion coefficients in anisotropic homogeneous porous medium. The method includes the numerical solution of a three-dimensional model of underground filtration flow. Its evaluation is based on the use of real hydrogeological data. One of the important tasks of mathematical modeling in representing the movement of pollutants in groundwater is to adequately determine the dispersion coefficients in porous media. When solving practical problems the dispersion coefficients in porous media are assumed to be constant both in isotropic and anisotropic media. This leads to inaccuracies in the solutions of the tasks for modeling the processes of filtration dispersion in porous media. In most of the cases the dispersion coefficients are determined by comparing the obtained numerical results from

the mathematical model solution with the observed in-situ concentrations and selecting values that yield the best approximation of the model. This method is very often unrealistic. It is known that the admissible form of the dispersion coefficients might not be true from the viewpoint of isotropy and homogeneity and might not correspond to the real porous medium. The advantages of the proposed method are that it evaluates the dispersion coefficients on the basis of measurable hydrogeological parameters and uses the numerical solution of a hydrodynamic model, which is known in practice. The proposed methodology will be most useful for porous media, where no (measured) data are available for the transport of pollutants and in the cases when hydrodynamic dispersion should be separated from chemical dilution.

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379 - ENVIRONMENTAL POLLUTION IN THE RIVER EZERKA (KOSELSKA) - LAW, ECONOMIC AND SOCIAL ASPECTS

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"If the miracle exists in this planet, it is water" : Loran Eisley 1957

The pollution as a live issue has global character without national borders. According to this, this widespread human activity begins to change the look of our planet, as done by a geological force. Today all environmental systems (forests, mountains, rivers, seas and oceans), ask for to be used from the human being rationally.

People, as changing the way of life and as they dont regard limited resurses of the water, with different activity has made the pollution of the water in high degree, but this activities without control got influence in dissapearance of the life in water eco - systems. Is for regret the fact that one thing like this is happening in Ohrid Lake.

River Ezerka is very important becouse is a tributary of Ohrid Lake. Ohrid Lake is a unique system, rich in different kinds of plant and animal world. One peculiar thing of this lake is its geological age. The banks of the lake have been populated since the parahistoric ages. The archeological sites of inhabitation date back from the age of Neolit.

The aim of this paper was analysis, parameters for pollution control NO_2^-, NO_3^- NH_4^+ and toxicological parameters heavy metals like Fe^{3+}, Mn^{2+}, Cr^{3+}, Cr^{6+},Fe, Cd,

Pb, Ni and Zn. Studed water samples were taken in different locations of River Ezerka and one a lakeshore where the water of this river pours in the Ohrid Lake. Determination of analysed parameters for pollution control and heavy metals was done using UV-VIS Cam Spec M 330, Atomic Absorphion spectroscophy using a Perkin Elmer 370 A and 370 flame - aer acetylene and AAS Peyunicam 926 model.

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380 - THE IMPACT OF BIOLOGICAL, CHEMICAL AND PHYSICAL POLLUTION ON THE WATER QUALITY IN RIVER KLINA

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In this work the research is focused on the water of Klina river through its flow from the starting point-Kuqica village to its outfall in the river of Drini i Bardhe, Kline-Kosovo.

The research is made in the physical-chemical and biological component (bacteriological and algological).

As the contamination indicator we used the measurable values of some of the physical-chemical parameters such as: temperature, odor, turbidity, conductivity, pH, dissolved oxygen, saturated with oxygen, total organic carbon, nitrates, phosphates ion, detergents, sulphate, COD as well as BOD5, and those of water microbiologic such as: number of the heterotrophic bacteria, the total coliforms, fecal streptococci, anaerobic sporogenes as well as the presenc of the three groups of the physiological bacteria (proteolytics, amylollyctics and lipolyctics bacteria).

Contemporary methods have been applied for the examination of samples. Five points (localities) have been investigated through the flow of the river in order to define the contamination level with the inorganic and organic contaminant base. The values of the physical-chemical and biological parameters had the interference and fulfilled one-another by arguing the contamination level based on the saprobiologic valorization of the investigated water.

In the paramount flow, the river Klina is clean and belongs to the limnosaprbe area, continuing further through its flow, the level of the saprobilities is constantly increased (area - mezosaprobic and - mezosaprobic), whereas the greatest level of contamination is reached in the five point (polisaprobic area).

The aim of our research is to give a review regarding the contamination level of the investigated water, nature of contaminants, as well their sources, in order that our results to serve as a mirror for the measures that must be taken for the prevention of the water contamination in this river.

Keywords: bacteria, coliforms, streptococci, Klina River

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382 - PHOSPHATE ACTIVITY INDEX (PAI)- A MODEL FOR MONITORING OF POINT SOURCES OF POLLUTANTS OF THE DANUBE RIVER IN NOVI SAD (R KM 1262-1245)

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In this paper hydrological and ecological attributes of urban river stretches of Serbian Danube River - sector in Novi Sad City (the capital of Serbian northern province of Voyvodina) was investigated concerning solution of conflicts between water supply and point pollution sources. The water quality after the microbiological influence of wary leaky water system of the Novi Sad City has been investigated by use of water phosphatase enzyme activitiy in the course of 1997-2005. Our proposed model for daily, seasonaly and annualy estimation of Ecological status (Directive 2000/60/EC) by the continual and effective research of the Danube River in Novi Sad indicated worsening of water quality of the banks and middle currrent of the river (Figure). The SEM detection of iron-oxidizing stalks of bacteria Gallionella was shown in drainage wells of Oil Rafinery situated at the stretch four of the Danube River in Novi Sad.

Keywords: Ecological status, Phosphatase activity, The River Danube, Novi Sad, Gallionella

383 - SEASONAL DYNAMICS OF PHYTOPLANKTON COMMUNITIES IN THE DANUBE-TISZA-DANUBE HYDROSYSTEM IN SOUTHERN BANAT REGION (SERBIA)

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Ecological potential of the Danube-Tisza-Danube hydrosystem (HS DTD) in Southern Banat region was estimated with phytoplankton composition, chlorophyll a, extracellular phosphatase enzyme activity and ratio f oligotrophs and heterotrophs- Fo/H index. Phytoplankton communities have been characterized with the presence of 140 of algal taxa of which 19 Cyanobacteria, 18 Euglenophyta, 62 Bacillariophyceae, 2 Chrysophyceae, 39 Chlorophyta, 2 Dinophyta during the -dry year" of 2003 followed by 2004. The blooming of phytoplankton communities has been detected in small river Moravica contrary to lowest density of phytoplankton communities found in the Nera River. The increase of abundance in plankton denoted colonization in autumn after June of 2003/2004. The dominant diatom species belonged to the following genera: Stephanodiscus, Cyclotella, Diatoma, Cymbella, Amphora, Cocconeis, Gomphonema, Rhoicosphenia, Nitzschia, Navicula, Aulacoseira, Surirella, Achnanthes spp.. Stabilization of algal biomass and more aerobic condition was found in rivers Tamis and Nera during the research. The Scanning electron microscope (SEM) revealed that diatoms in DTD canals in southern Banat region posess fine granulation and large spines. Saprobic- Pantle-Buck index and trophic potential of phytoplankton- chlorophyll a concentration, pointed by a series of colored markers suggested categorization of Ecological potential of the Danube-Tisza-Danube canals (blue- excellent, green-good, yellow- moderate, orange- poor, red- bad). Downstream the Tamis River, moderate and poor ecological potential of Danube-Tisza-Danube hydrosystem in Southern Banat region was proposed.

Acknowledgements

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TOPIC 6

LAKES

022 - MODELLING OF SEASONAL AND LONGTERM TRENDS IN LAKE SALINITY IN SOUTHWESTERN VICTORIA, AUSTRALIA

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In southwestern Victoria a large number of lakes are scattered across the volcanic plains; many have problems with increasing salinity. To identify the hydrologic components behind this problem, three lakes, Burrumbeet, Linlithgow and Bunninjon, were selected for detailed water and salt budget modelling using monthly values of rainfall, evaporation, surface inflow and outflow, and groundwater inflow and outflow. Lakes Linlithgow and Bunninjon are closed drainage basins, simplifying the modelling. On average, rainfall begins to exceed evaporation with the onset of winter rainfall in May, so both stream hydrographs and lake levels rise and lake salinities decline. In summer lake waters become more saline as the lake levels drop due to evaporation and solutes in the lakes (mostly derived directly from rainfall onto the lake surface and indirectly via runoff) are concentrated.

The modelled lakes have become more saline over the last decade, a time of drought with below average rainfall, and all eventually dried out, their salinities rising to very high levels as they shallowed (up to 22, 63 and 67 mS/cm for Lakes Burrumbeet, Linlithgow and Bunninjon respectively). Lake Burrumbeet is generally much less saline than Lakes Linlithgow and Bunninjon (median salinities of 3.7, 17.2 and 12.6 mS/cm respectively). Lake Burrumbeet has substantial groundwater outflow (greater than surface outflow), probably due to leakage through a maar at one end of the lake. This limits the amount of time the lake water is subject to evaporation, and also allows significant salt export. The other lakes have no surface outflow and are underlain by thick clay-rich soils, so they do not leak. Lake Linlithgow is more saline than Lake Bunninjon, perhaps because has a higher area/depth ratio (3.4 compared to 1.5) and dries out more often.

Keywords: groundwater salinity, lake salinity, water budget, salt budget

040 - IDENTIFICATION OF NON-NATIVE FRESHWATER FISHES IN ALBANIA AND ASSESSMENT OF THEIR POTENTIAL THREATS TO THE NATIONAL BIOLOGICAL FRESHAWATER DIVERSITY

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In Albania, alien freshwater fish are continuing to steadily increase in number of species (reported in this paper to be more than 17), abundance, and distribution. In general however, their impacts are not well quantified in either environmental or economic terms and current management to reduce their impacts is limited and lacking direction.

From around the middle of the 19th century, international transfers of fish species, especially for sporting purposes and the provision of an additional food supply increased apace. After the end of the Second World War the number of introductions of alien fish species increased still further, helped by the development of advanced artificial spawning techniques (Elvira 2001).

The fact that European countries are important recipients of alien fish is ascribed by Welcomme (1992) to the fact that they have generally impoverished fish faunas and that introductions have been made, with a variety of motives, to increase their ichthyological biodiversity. The naturalization of some of the alien fish species that are able to reproduce successfully in the wild has had catastrophic consequences. There is the case of well established Lepomis gibbosa in Macro Prespa Lake. Species associated with high impact tend to have a broad diet and abundant populations in native and disturbed habitats. Likewise, host aquatic environments resistant to impact tend to be heavily managed or disturbed, productive, and inhabited by complex communities.

In Albania, it was central government until 1990, owner of the all fish farming centers, with a total surface of 215 ha, to occupy on the restocking of the reservoirs, natural and artificial lakes. In this paper we describe the presence and riks of the following species: Ameiurus melas, Carassius auratus, Megalobrama amblycephala, Ctenopharyngodon idella, Cyprinus carpio, Gambusia affinis, Hypophthalmichthys molitrix, Hypophthalmichthys nobilis, Oncorhynchus mykiss, Parabramis pekinensis, Poecilia reticulate, Peudorasbora parva, Silurus glanis, Lepomis gibbosus, Stizostedion lucioperca, Perca fluviatilis, Tinca tinca, etc.

Looking towards the concerns for the environmental flow-sustainable action at the protected area, biodiversity conservation, preserving the internationally important species of flora and fauna and recreation- those can be reflected into a

regulatory and policy measures, local actions that strives to preserve the biotope conditions.

Keywords: Alien fish species, freshwater bodies, introduction, sustainable actions, biological impacts

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042 - ANALYZE OF THE SOCIO ECONOMIC STATUS AND MARKET TRENDS IN PRESPA NATIONAL PARK - LAKE ARE ON ALBANIAN SIDE

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There are a number of different stakeholders and resource users in the National Park Prespa Albania. The most important consumptive resource use with regard to extent and potential conflicts with the NP is livestock breeding (grazing of animals and looping of fodder) and the extraction of firewood.

In this paper we are intending to analyze the socio economic status and market trends in Prespa National Park. Given that fish was subject to extreme pressure in the past, changes in the fish population and fish community structure were the result. Low number of species, usually endemic species, is threatened to further decrease.

Within the National Park Prespa there are no markets and shops to buy fresh products and therefore every household in the area covers its daily needs for dairy products and meat through own subsistence production. There are no marketing and processing capacities inside the Park. Almost 100% of dairy products and 80% of meat is used for home consumption. Small quantities of milk and cheese are sold to neighbors and 20% of meat is sold to traders at the farm gate and within the community (lamb and kid within the community and calf to traders). Although there is a general trend of decreasing goat and sheep numbers, people keep animals for different uses. 60-70% of all milk is processed into cheese and the rest is used for drinking or processing into yoghurt and butter. The average price for cheese is 2.3 €/kg and for lamb/kid meat 2-/kg.

Most households slaughter or sell the young stock and keep sheep, goat and cow. The average household has four sheep, five goats and one cow. Assuming one lamb/kid4/calf per animal/ year, the total estimated meat amounts to 210 kg.

160 kg (80%) is on average consumed at home, resulting in about 40 kg meat consumption per person/year (four people/ household). 60-70% of all households additionally slaughter one pig/year if they sell the calf.

Keywords: Prespa National park, stakeholders, socio economic status, household

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050 - DETERMINATION OF SOME PESTICIDES IN THE REPUBLIC OF MACEDONIA'S LAKES BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY

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An HPLC-UV-DAD method was applied to the determination in surface waters of pesticides widely used in Macedonia for agriculture purposes, such as dimethoate, 2,4-D, linuron and MCPP. The water samples were extracted by off-line methods, either by solid phase extraction (SPE) or by liquid-liquid extraction. After concentrating the samples, the compounds under study were separated on a Stability RP chromatographic column, using a mobile phase composed of acetonitrile-water-acetic acid. Ultraviolet detection was carried out for dimethoate, 2,4-D, MCPP at 229 nm, and for linuron at 249 nm.

Recoveries performed on 500-mL volumes of drinking water using the SPE method were found to range between 64 to 92%, according to the pesticide. Detection limits going from 0.009 μg/L to 0.11 μg/L were obtained for the compounds under study. Our HPLC-UV-DAD method was applied to water samples from the three largest natural lakes in Macedonia, Ohrid, Prespa and Dojran, as well as from three man-made accumulations, Tikves, Mladost and Paljurci, that receive runoffs from agriculture lands. It was found that the measured pesticide levels depended on the extraction method, the compound, the sampling period, and the sampling site.

Keywords: dimethoate; 2,4-D; linuron; MCPP; SPE, liquid-liquid extraction, HPLC-UV; Macedonian lakes.

086 - WATER BALANCE MODEL OF LAKE DOJRAN

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Lake Dojran is an important resource for the population of the Vardar basin both in terms of recreation and fish. During the 1950s the lake was very full and there were worries of flooding. Levels stayed high for several years and then started to decline in the mid 1980s. The decline coincided with drier weather and increased abstractions of water for irrigation. In the early years of new millennium levels started to increase. The increase coincided with a wetter period and with intensive pumping into the lake.

This paper describes a study into the reasons for the decline of the lake, the reasons for its recovery and what might be needed in the future to maintain the life of lake.

The study used two models. A monthly rainfall/runoff model, HYSIM-M, which was used to calculate the inflow to the lake. A spreadsheet based model was used for the water balance calculations.

Data were obtained on precipitation, temperature, wind speed, humidity and sunshine from stations on the Macedonian side of the lake. The last four parameters were used to calculate PET using the Penman open water formula. Data were available from 1961 to 2005. The models were able to simulate accurately the levels in the lake.

The conclusion is that most of the decline in levels is due to irrigation abstractions. The relatively minor recovery was due in roughly equal proportions to wetter weather and pumping.

If pumping continues at its present rate the lake will continue shrinking to a size where the reduction in evaporation will equal the rate of irrigation abstraction. When full the lake has an area of around 40 km². In the future it may become as small as 5 km². If pumping for irrigation stops, and weather continues to be similar to what it was for the last 50 years, the lake will only recover slowly over several decades.

Keywords: hydrology, simulation, water balance, lake, model, transboundary

094 - WETLAND MANAGEMENT AT MICRO PRESPA LAKE, ALBANIA

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Wetlands represent an essential part of the ecosystem of Micro Prespa Lake. Their surface varies during the year: they are larger during the wet season and smaller during the dry one. The water level reduces because of the higher evaporation and the water use for irrigation.

Wetlands are mainly used for fishing and hunting water birds. Peasants of the villages nearby place their fishing boats and build up fishing or hunting facilities in the wetlands.

In Summer time, when water withdraws fully, a part of the wetlands surface is used for cultivating vegetables and forages or is conserved and used for pastures (mainly for livestock). Canes growing within the wetlands are used in construction, in handcrafts, etc.

Wetlands are important resources for aquatic, sport and scientific tourism. Their use for economic purposes has brought about considerable environmental impacts. Fishing, which increased rapidly after the '90ies and particularly after 1997, has damaged the wetland fauna. The agriculture use of wetlands, intensive agriculture in particular of vegetables and forages, requiring higher quantities of irrigation water, fertilizers and other chemical substances, have abused water, have contaminated it, and have endangered the life of several species. Forests have been abused as well. Unfortunately, monitoring of economic activities and of their ecological impacts to the wetlands, so far has been very week. Little evidence exists about the benefits and loss due to the current use and attitude towards the ecosystem at Micro Prespa Lake.

Minimization up to the full ceasing of those economic activities that damage and pollute wetlands, enforcement of legislation, monitoring of development and their ecological impacts, as well as raising the awareness of the local community on the economic and ecological value of wetlands resources, would be crucial steps towards the sustainable management of Micro Prespa Lake and the related ecosystem.

Keywords: wetland, management, economic valuation

096 - DYNAMICS OF PLANT COVER VEGETATION OF LAKES PRESPA AND THEIR WATERSHED (ALBANIAN SIDE)

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Assessment and evaluation of plant cover vegetation at the Lakes of Prespa and their watershed was performed based on qualitative and quantitative analyses of the Albanian Topographic coordinative map (1:50 000 scale, of the year 1982), CORINE map (1:100 000 scale, of the year 2000), the Satellite image assessment methods (Image © Terremetrics, Europa Technologies, 2006-2007 yr.), and digital photo-images taken during last four years. All data are compared with data collected along last five years, in the land using randomly located sampling plots method (Reiss et al, 2000).

The EUNIS habitats (Davies & Moss, 1997) are represented on the watershed by five types of vegetation: Temperate grasslands and heaths; Mediterranean grasslands, matorral, maquis, and forests; Oromediterranean grasslands and scrub; Temperate woodland fringe, scrub and forest and Montane grasslands, heaths, tall-herb and snow bed vegetation, whereas the Fresh water aquatic vegetation is dominated by the following classes: Phragmitetea Tx. et Preising 1942; Potamogetea R. Tx. et Preising 1942 and Lemnetea Tx. 1955.

The terrestrial vegetation is represented by herbaceous plants of the Graminaceae, Labiatae and Compositae family that are dominate among woody plants.

It is quite evident that the increase of cover floating plant vegetation of the Mikro Prespa Lake and the decrease of the cover vegetation on the watershed landscape may have strong influence on the water quality and water biology of the lakes that needs further complex limnological investigations.

Keywords: vegetation, plant cover, Lakes Prespa, freshwater vegetation, limnology etc.

113 - A STUDY OF THE TOXICITY OF PESTICIDES OCCURRING IN THE OHRID LAKE

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Contamination of surface waters resulting from the intensive use of pesticides in agriculture constitutes a particularly urgent and serious environmental problem because of the generally great stability and potential toxicity of these pollutants. The republic of Macedonia is a rural country where pesticides are rather widely applied. Recently, in the framework of a french-macedonian collaboration, we have performed a theoretical and experimental study of the mechanism of the photodegradation reaction of 2,4-D, an important herbicide, in aqueous medium, as well as an investigation of its toxicity [1,2].

The goal of the present work was to evaluate the toxicity of pesticides of agricultural interest occurring in the Ohrid lake waters, which have been also qualitatively and quantitatively analyzed by an high performance liquid chromatography (HPLC) for the presence of pesticides residues. For this study, we have selected seven pesticides, including dimethoate, 2,4-D, paraquat, linuron, malathion, deltamethrine and mecoprop.

We have measured the individual toxicity and IC50 parameter of these pesticides by means of the Microtox® method, based on the measurement of bioluminescence inhibition of Vibrio Fischeri bacteria. This method was also applied to water samples containing pesticides residues, collected in October 2006 in the Ohrid lake. After liquid-liquid extraction of the aqueous samples, the pesticide residues were identified and quantified by HPLC. Then, the global toxicity of these Ohrid lake water samples was evaluated by the Microtox® method. The interest of this toxicological approach for investigating the water quality and observing the environmental impact of pesticides residues in natural waters is discussed.

Keywords: pesticides toxicity; Ohrid lake waters; Microtox® method.

119 - BACTERIOPLANKTON DYNAMICS AND THE INFLUENCE OF ENVIRONMENTAL FACTORS ON IT IN THE SREBARNA LAKE

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The Srebarna Lake is located on the Bulgarian bank (2 kilometers to the south) of the Danube River, 16 km west of the town of Silistra (close to Bulgarian-Romanian boundary) and is the most prominent reserve in Bulgaria. It has been a Protected Site since 1942, a Reserve of the Biosphere since 1977 and was included in the List of the World Heritage Sites in 1983. Srebarna (Silver) is a freshwater hypereutrophic shallow lake. The flora and fauna in the lake and its surroundings have been monitored and the data have been published for many years; however, bacterioplankton and its trophic relationships with environmental factors have been poorly investigated. The recent study explained the dynamics of bacterioplankton development in spring, summer and autumn during the years 2005-2006, the influence of physical and chemical factors on this development and the importance of bacterioplankton size structure in the predator-prey relations between the microbial communities and the first two trophic levels of the classical grazer food chain in the pelagial - phytoplankton and zooplankton, by means of statistical analyses.

Keywords: bacterioplankton, trophic relationships, microbial food web.

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140 - ENVIRONMENTAL AND FISHERY MANAGEMENT OF TRANS-BOUNDARY PRESPA LAKES (MICRO AND MACRO) AND THEIR INVADING TORRENTS WITH SPATIAL DATA ORGANIZATION

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The trans-boundary ecosystems of Prespa lakes are environmentally important ecosystems due to their biodiversity and also they are traditionally inland water fishery areas, not only for Greece but also for the neighbouring countries Albania and R. Macedonia. Unfortunately during the last decades fishery production has

decreased because the ecosystem of Prespa lakes is under intensive exploitation of natural biological resources as also due to the conflict functions and uses of their waters. Prespa lakes ecosystems constitute sensitive and vulnerable ecosystems with vital value for biodiversity and for the benefit of local populations, thus their protection and conservation is important for the rural cross-border development.

This paper describes an application that uses relational and spatial databases in order to develop a pilot methodology for the total environmental monitoring and management of trans-boundary wetland ecosystems and also using thematic mapping as an effective tool for the dynamic organization of data.

The data was collected from bibliography, scientific papers, books and research projects concerning the ecosystem of Prespa lakes with their invading torrents in the Region of Northwestern Macedonia, in their Greek part. The descriptive, qualitative and quantitative information such as demographic, hydrological and geomorphologic data, physicochemical characteristics of the waters, lake flora, avifauna, fish fauna, water and land uses, economic activities and human interventions, were initially registered in a relational database. The database was further used to form a spatial database in G.I.S. environment. Consequently, thematic maps were generated to visually represent the special characteristics of the ecosystem.

The representation of information with dynamic thematic maps, within the process of information management enables the recognition of combined productive, economic, biological and social values in the sensitive trans-boundary ecosystem of Prespa lakes, for decision-making purposes. It is a useful tool for local authorities and managers in environmental and fishery planning and management within sustainable development based on the local characteristics of the sensitive wetland ecosystems and also for researchers and students as a reliable reference.

Keywords: database, Prespa lake ecosystem, spatial databases, environmental management, fishery management, thematic mapping

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141 - CHANGES IN THE FISHERY COMPOSITION OF GREEK PART OF TRANS-BOUNDARY PRESPA (MICRO AND MACRO) LAKE ECOSYSTEM

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The trans-boundary Prespa Lakes Micro (Small) and Macro (Big), in the borders

of Greece, Albania and R. Macedonia, are very important wetland ecosystems due to their biological biodiversity and natural environment, while currently are protected from international legislation. Although they are considered as traditionally inland water fishery areas, they tend to lose their characteristic profile due to the degradation and the overexploitation of their natural resources and the reduction of the most important commercially fish species.

This paper describes the changes in the composition of the fishery production regarding to the fish species caught in the Greek part of the above lake ecosystems during the last decades of the 20th century.

Data were collected from the local Greek Fishery Department and scientific references, concerning yearly fishery production for the total catch and analytical for the most important commercially fish species as the Common carp (Cyprinus carpio), the Roach (Rutilus rutilus), the Prussian carp (Carassius gibelio), the Mpriana or Briána (Barbus prespensis) and European Chub (Squalius cephalus). The collected data were initially organized and analysed with MS-Excel and further the composition of the fishery production was estimated through the percentage of the most important commercial fish species. Then, it was presented and discussed separately for the two lakes the changes in the composition of the fishery. Finally, the Minitab 13.20 software was used to perform through modelling short - term forecasts regarding to the ratio of the dominant fish species caught from the fishermen.

The results signify the evident degradation of the fishery production of these two trans-boundary lakes and also the selectivity of the fishery in the substitution of some important environmentally fish species with sensitive life cycles.

Findings can be helpful to the neighboring responsible authorities within the development of a common trans-boundary sustainable fishery strategy aiming to protect biodiversity and sustain local economy for the Prespa lakes.

Keywords: Prespa lakes, transboundary wetlands, fishery composition, fishery, environmental management.

200 - RELATION BETWEEN HYDROLOGICAL CHARACTERISTICS AND ANTHROPOGENIC INFLUENCE IN THE CONTEXT OF LAKE PROTECTION - CASE STUDIES OF PLITVICE LAKES AND VRANA LAKE IN DALMATIA (CROATIA)

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Lakes represent especially fragile and valuable aquatic systems, therefore often protected by law in the category of a national park, nature park, special reserve, natural monument or important landscape. Protection of lake's ecosystems is mostly based on unfavourable anthropogenic impact assessment and finding a way of diminishing it. What is often neglected are the hydrological mechanisms of lakes' systems and the consequent changes in hydrological conditions which can significantly increase the risk of potential unfavourable impact, hence making an important issue to consider in the complex integrative protection approach.

This paper analyzes the problematics on the case study of Plitvice Lakes National Park, more specifically its largest lake Kozjak, and of Vrana Lake near Biograd, protected with its immediate surroundings in the status of a nature park. Both lakes have originated from karst area, but retained their specificities. While the lake Kozjak, with the surface of 0.83 km², makes an integral part of a 16 lakes cascade with flowing water, Vrana Lake is the largest natural stagnant waterbody in Croatia, comprising 30.2 km² of surface, with depth so small defining it partly as a wetland. Different geographical positions and different depths condition the water dynamics of these two lakes.

The given paper analyzes interrelations of characteristic water quality parameters and yearly flow variations in the water systems of each of the mentioned lakes, and also, on a larger time scale, defines relation trends between the two lakes themselves. Special attention has been given to salification mechanism analysis of Vrana Lake, and the consequences of this process on the lake's system. The importance of integral observation of natural and anthropogenic influences is

determined, pointing out the impact of water quality and hydrological conditions on biological characteristics of the lakes' systems, and providing the guidelines for improving their protection.

Keywords: lakes, nature protection, hydrological systems, water quality, Plitvice Lakes, Vrana Lake (Dalmatia)

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205 - ALLOZYME ELECTROPHORETIC ANALYSIS OF BARBUS M. PETENYI POPULATIONS FROM LAKE OHRID (MACEDONIA), RIVER ELESHNITSA (BULGARIA) AND RIVER SHKUMBA (ALBANIA)

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In this paper 38 samples from Lakes Ohrid (Macedonia), 27 samples from River Eleshnitsa (Bulgaria) and 12 samples from River Shkumba (Albania) were analysed. Genetic-biochemical differences among Barbus m. petenyi Heck populations from Lake Ohrid, River Eleshnitsa and River Shkumba have been investigated using starch-gel electrophoresis and isoelectric focusing (IEF) on thin polyacrilamide ampholine gel with pH gradient between 3-10. The fish were examined for electroforetic variants of general muscle proteins (PROT) and six enzyme systems (AAT, EST, MDH, LDH, ME, SOD). Based on protein starch-gel electrophoresis and isoelectric focusing, some differences between three barbel populations were detected.

Keywords: electrophoresis, isoelectric focusing, and enzymes, Barbus petenyi Heckel.

207 - MEDICAL AND ENVIRONMENTAL PROBLEMS IN BAIKAL LAKE REGION (RUSSIA)

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The Eastern-Siberian region near the Baikal Lake has the reduced possibilities for nature restoration, which is stipulated by the climatic, orographic, morphological features of the territory.The potential of environmental self-clearing, the superficial water reservoirs as well as soil is considered to be as low one. In this connection, this region may be related to the zone of limited industrial assimilation. The Lake's ecosystem stands the most powerfull anthropogenic pressing from the industrial enterprises, communal-householding sphere of the selitebic territories and recreative zones. Economic activity is mainly concentrated (3/4) in the southern areas of Irkutsk Region and the Republic Buryatia where about 90% of populations are busy with the regional economics.

The long-term observations have shown that the enterprises of the Pulp and Paper industry and the asbestocement good production concentrated in the southern areas of the Lake Baikal were found to be the main sources of environmental air pollution. Throwing down the water into the natural water reservoirs amounts more than 500 million cubic meters annually, approximately 30% of the polluted sewage are thrown down into the water recervoirs. The averaged annual concentrations of the principal pollutants (oil-products, phenols, surfactants, copper, sulfur oxides, zinc) in the river Selenga water, the place of falling into Baikal, were found to be 1-3 Limited Allowed Concentrations (LAC), iron up to 6 LAC. The increase in phosphorus, nitrogen, phenol contents is observed to be in the southern aquatory compared with the background values. Sanitary-hygienic analysis of the pre-mouth aquatories of the rivers at the southern area of Baikal has shown that the bacteria distribution of intestinal bacillus group differed in the microniduses. Based on the date by B.B. Namsarayev et al. (1998), the maximal levels of the Baikals bottom deposits near the place of throwing down the sewage from the town of Baikalsk. The sulphate reductant activity depends on a number of ecological factors the main of which are known to be the anaerobiosis. The presence of Cl.Botulinum, type E, has been revealed in 23% of the samples from the riverside soil and the bottom deposits in Selenga's shallow places. This may confirm the activity of anaerobiosis in the region studied.

The alteration in the pre-bottom microbiological picture resulted in the risk increase in the botulism incidents in botulism incidents among the population of the Baikal region. The significant increase in botulism incidents associated with the consumption of fish omul from the southern Baikal's area has been observed

to the period connected with an economic state destabilization in Russia. The populated areas of the riverside zone are related to the settlements of the urban type and the rural settlements for which the low indices of planning and organization of public services as well as the hypocomfortable living conditions are characteristic. The population (70%) of the riverside zone is known to use the open water reservoirs (the Lake Baikal and its tributaries) as the source of water supply.

The problem of supplying the drinking water of good quality for population which must be satisfied with the claims of the hygienic normatives is considered to be as one of the heaviest problems in the Republic Buryatia, especially in a number of the rural regions; 33% of the samples didn't corresponded to hygienic claims in the sanitary-chemical indices, 5,8% in the microbiological indices. The important problem is known to be not only the quality of natural environment in Baikal region but the population health state living near the Lake Baikal. The territory is characteristic with a low level of medical-demographic living indices: high mortality rate, low living duration, low birth-rate. The diseases of circulation organs, traumas, intoxications, accidents and malign tumours are known to be at the first place among the mortality causes. The prevalence of cardio-vascular pathologies. In the rural settlements the incidents of the digestion system diseases, infectious and parasitary diseases were found to be high among the people using the decentralized sources of water supply.

So, the purposefull studies on working out the procedures of monitoring the population public health system, scientific grounding the realization of the national Programmes at the Baikal region need to be performed to solve the problems above and increase in the regional safety.

Keywords: lake Baikal, chemical pollution, population health

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221 - COMPARATIVE ANALYSIS OF THE INTERLOBULAR INTERSTITIUM OF DOJRAN PERCH (PERCA FLUVIATILIS MACEDONICA KAR.) AND OHRID TROUT (SALMO LETNICA KAR.) IN THE PRESPAWNING AND POSTSPAWNING PERIOD

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In this paper a comparative analysis of interlobular interstitium of Dojran perch (Perca fluviatilis macedonica Kar.) and Ohrid trout (Salmo letnica Kar.) in the

prespawning and postspawning period is made. The vascularisation on the level of interlobular interstitium in the prespawning period in Dojran perch is enormously narrowed, minimally present, except in the hilus region, where the vascularisation and the cellular elements are remarkably noticed. During the postspawning period on the level of the interstitium vascularisation is clearly distinct, with wisible cellular infiltration. As to the cellular components, besides Leydig cells, fibroblasts and myoid elements are remarkably present. The myoid elements are with smooth muscular nature. In their cytoplasm the presence of microphilaments can be noticed. In the prespawning period interlobular interstitium in Ohrid trout is minimally present, enormously narrowed and brought to minimum. The celular components, fibroblasts and myoid elements are rare in the conecting stroma. Rare isolated macrophages can be seen. In the postspawning period the interlobular interstitium is remarkably developed and vascularised. On a level with interstitium out of cellular elements there are fibroblasts, colagenous fibrils, myoid elements and Leydig cells.

Keywords: Perca fluviatilis macedonica Kar., Salmo letnica Kar., prespawning and postspawning period, interlobular interstitium.

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224 - WATER BALANCE OF LAKE PRESPA

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Lake Prespa is second largest natural tectonic lake in the Republic of Macedonia. It is recognized for its rich natural and cultural heritage. Two natural parks, Galicica and Pelister, and a strictly protected wetland area Ezerani are within its catchment. The lake itself is the only Ramsar site in the country. Besides the natural beauty, the lake is an important resource for the economies of the three countries that share it - Macedonia, Greece and Albania.

In the last two decades, the surface water level of the lake has dropped for more than 6 meters, endangering thereby both the fragile wetland environment and the economies in the region. Efforts are made to introduce integrated water management in a highly complex transboundary context and changing transitional societies and economies.

Establishment of a reliable water balance of Lake Prespa is a necessity for sound planning and management decisions.

The watershed of Lake Prespa does not have a surface outflow. The lake drains through karstic massif of Mountain Galicica to 150 meters lower Ohrid Lake.

This paper is an effort to study the elements of the water balance of the watershed. Sparse hydrological and meteorological data available have been used. A hydrological analysis and hydraulic modeling with HEC model series of USGS were carried out, in order to establish the runoff of the numerous small tributaries. A thorough analysis of the water use in the catchment has been made as it represents a significant element of the overall water balance. The output of the balancing model has been checked with historical data of the lake surface water level and the outflow at the karstic springs in Lake Ohrid. Lastly, future development scenarios have been applied to predict possible consequences of climate change and increased water use in the catchment.

Keywords: hydrology, water balance, runoff modeling, karst

230 - EVALUATION OF TROPHIC STATE IN BISHTARAKA LAGOON

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The Bishtaraka's Lagoon is located in central coastal region of Albania and exists as transitional environments between land and sea. The lagoon covers a surface c.155 ha. The average depth of the lagoon is approximately one meter. Sand bars partially isolate the lagoon from the Adriatic Sea. The lagoon consists of a number of interrelated habitats. The terrestrial portion includes the sandbar and the surrounding coastal strip. The aquatic portions, which account for more than 90% of the lagoon's surface area, include channels, shallows, mud flats and salt marshes. These varying habitats host a number of organisms and diverse communities.

The surface area of the lagoon has decreased over the course of the last fifty years. Factors contributing to this decline include land reclamation for human use (artificially drained for agriculture, fish-farming), erosion, pollution etc.

Data on the trophic state of Bishtaraka Lagoon are presented. Level of trophic

state is based on standard methods for analysis of macrophytic vegetation (Wetzel, 2001) and chlorophyll a content and other photosynthetic pigments of phytoplankton, dissolved oxygen (DO) and biological oxygen demand (BOD), Phosphor contents. Also are measured physic characteristics of waters like temperature, Ph and turbidity of water.

Plant communities evaluation is based on qualitative and quantitative characteristics and are classified through principals of Zurich-Montpellie school.

Monitoring of chlorophyll a content and other photosynthetic pigments of phytoplankton, dissolved oxygen (DO) and biological oxygen demand (BOD), Phosphor contents. are carried out during a year from April to Septembre 2007. In Lagoon are selected 4 stations for samples taking.

Evaluation of water trophic level is based on classification proposed by H-kannson (1994).

Analyses for determination of dissolved oxygen (DO) and biological oxygen demand (BOD) are realized through Winkler method.

Based on the collected data we can evaluate that Bishtaraka Lagoon is charachterized by a high trophic state - eutrophic level.

Keywords: chlorophylls, lake, lagoon, phytoplankton, trophic state.

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243 - THE WATER BUDGET AND THE UNDERGROUND OIL PLUMES OF LAKE KOUMOUNDOUROU

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At this paper an investigation is made concerning water balance and water level fluctuations of the aquifer at the vicinity of Lake Koumoundourou, Attica Greece. Lake Koumoundourou is the acceptor of the petroleum leaking underground products from the premises of the nearby ELDA oil refinery and AVEK military camp. The leakages have the form of plumes floating on and diffusing into groundwater.

The surrounding area of the lake was considered holly at the ancient times, because it was part of the sacred way (Iera Odos) from Elefsina to Elefsinio, west

of the Acropolis of Athens.

Borehole monitoring of groundwater and oil products, making use of interface probe, led to the construction of water table and product thickness underground maps. From these maps, it is clear that the most thick product is encountered north of the refinery premises, with thickness diminishing as the lake is approached.

Water balance of the lake sub-basin was investigated making use of WTRBLN model of Thormwaite and Mather. The mean value of the surface water percolation coefficient (S) for ten years was found to be 116 mm/year.

Keywords: Lake Koumoundourou, Greece; ELDA Refinery Greece, Groundwater, Oil product pollutants, water balance, Thormwaite and Mother.

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246 - WATER QUALITY OF SMALL LAKES IN KHOREZM, UZBEKISTAN

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The Khorezm region of Uzbekistan, in the Aral Sea basin, is a productive agricultural area that typically requires large amounts of imported Amu Darya River water for irrigation. Excess irrigation water from agricultural fields in the Khorezm region flows into more than 450 small lakes that have areas of 1-20 ha via collectors or ground water discharge. The water in some of these lakes is used for agriculture, fisheries and recreation. These unstudied lakes receive nutrients and other contaminants from agricultural activities. The objective of this study is to investigate the water quality of a set of these small lakes to assess anthropogenic influences.

The study of hydrologic and chemical processes is very important for understanding and estimating anthropogenic influences on water quality. For this purpose, monthly samples were collected in 13 small lakes from June 2006 to June 2007. Water samples at 3 sites on the Amudarya River were also

collected for comparison. Temperature, pH, salinity, conductivity, and dissolved oxygen were measured in the field. Collected water samples were analyzed for nitrogen (ammonia, nitrate, nitrite), phosphorus (soluble reactive phosphorus, total dissolved phosphorus, total phosphorus), major ions (calcium, magnesium, sodium, potassium, sulphate, chloride, hydrocarbonate) and total dissolved solids using standard methods. The findings showed seasonal variations in nutrient concentrations and salinity. In winter the lakes become more saline and had higher concentrations of nitrogen and phosphorus as lake levels dropped due to cessation of irrigation water inflow, but decreased in salinity and nutrient concentrations during summer when irrigation was at its peak and lake levels were higher. Peak concentrations of nitrogen occurred in March, whereas peak concentrations of phosphorus occurred in December.

The results of this research will help in understanding the effects of anthropogenic influences on the water resources in these small lakes in the Khorezm region and will assess the potential utility of these lakes as potential drinking water supplies, agriculture, aquaculture, and fishing.

Keywords: Aral Sea basin, lakes, irrigation run-off, water quality, anthropogenic impact, water resources.

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254 - PARASITE FAUNA OF GUDGEON (GOBIO GOBIO OHRIDANUSS KARAMAN, 1924) FROM THE LAKE OHRID

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The parasitological examination from the Macedonian part of the Lake Ohrid showed that of 94 specimens of gudgeon (Gobio gobio ohridanus Karaman, 1924) 61 fishes (64.89%) were infested.

In our case study the presence of 4 parasite species was established: Dactylogyrus cryptomeres f. typica, Cystidicoloides tenuissima, Philometra ovata and Pomphorhynchus laevis.

Individually, by the parasite species, the highest prevalence and intensity of

infestation was with Dactylogyrus cryptomeres f. typica. Prevalence was 59.57%, and the intensity of infestation was 6.07. The lowest one was with Cystidicoloides tenuissima and Philometra ovata. Prevalence was 2.13%, and the intensity of infestation was 1.0.

In our case study the Monogenea Dactylogyrus cryptomeres f. typica,is recorded for the first time in the ichthyoparasitofauna of Lake Ohrid and Macedonia.

Keywords: parasite fauna, gudgeon, Lake Ohrid.

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279 - IMPACT OF AERATION ON LIMNOLOGICAL CHARACTERISTICS OF UPPER LAKE, BHOPAL, INDIA

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The current work studied some of the aspects associated with the use of aerators in lake. Aeration improves water quality by increasing dissolved oxygen levels in the water especially where oxygen is needed i.e. at the bottom. The influence of a floating fountain type of aerator on the biotic and abiotic variables was evaluated in the Upper lake water. The Upper lake (Latitude 23°12'-23°16-N Longitude: 77°18' - 77°23' E) of Bhopal, India is an elongated water body and mainly used for drinking purpose. Three points of the lake were marked for taking of samples: 0 m, 10 m and 20 m from the aerator. Samples were taken before the use of aerator, with the aerator functioning and after the use of aerator. The limnological variables studied did not show significant differences when the three points were compared, but regarding the use of aerator, variables such as water temperature, transparency, pH, dissolved oxygen, total phosphorus and nitrate concentration showed significant differences when the water was mechanically agitated. There were no significant differences with the use of aerator regarding conductivity and total alkalinity values. The phytoplanktonic community has a direct influence of the aerator. The community was dominant by chlorophyta because these groups adapt quickly to changes in the environment.

Keywords: Aeration, floating fountain, lake, limnological charac

297 - TOURISM ACTIVITIES IN WETLANDS: A CASE STUDY OF KAVAK DELTA (ÇANAKKALE)

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Wetland is generally highly productive ecosystems which provide many important benefits. These benefits may be wetland functions (e.g. ground water recharge, flood control), use of the wetland or its products (e.g. site for wood collection or research site) or special qualities of the wetland (e.g. aesthetic component of the landscape or cultural significance).Wetlands have touristical, recreational, historical, scientific, and cultural values. Everyone likes being on or near the water.

Turkey has a long coastline and is bordered on three sides by the sea. Canakkale is one of the most important provinces of Turkey, with its natural, cultural, and historical characteristics. With a 750-kilometer-long coast and the Dardanelles, historically, it has been an attractive area.

Kavak Delta, where the present study was carried out, is located in the Northwest of Gallipoli Peninsula and is near the Saros Gulf. This wetland is 80 km far from Çanakkale city center and covers an area of 2136 ha. Kavak Delta has a significant importance in the coastal ecosystem of Turkey with its coastal sand dune and salt marsh vegetation in addition to being a crucial area for birds. Due to its features, it can be classified as a natural resource and has a potential for tourism. The area is suitable for bird and wild life observation, botanical tourism and sportive fishing. Moreover, the area offers a rich potential for coastal tourism activities.

In this study, the potential for tourism of the area was investigated and, suggestions on the effective and proper use of this area in terms of sustainable tourism and natural resources were put forward.

Keywords: Canakkale, Kavak Delta, Tourism, Wetland

304 - THE INVESTIGATION OF WETLAND ECOSYSTEM IN THE ARAPLAR GORGE AND ITS SURROUNDINGS

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In this paper, the wetland ecosystem rich in biologically diversity in the Araplar Gorge area, which is located in the southeastern part of the Biga Peninsula in the northwestern Turkey, was studied on the basis of biological properties and environmental pollution parameters. The area shows a considerable biodiversity in terms of the communities of water plants and terrigenous vegetation. In addition to the extensively distributed natural plant populations characterized by Typha latifolia, Phragmites australis, Salix alba, Vitex agnus-castus, Rubus canescens, Platanus orientalis, Paliurus spina-christi, Olea europa (Olive) also exists as a member of cultural plant species. The Araplar Gorge is drained by the Karamenderes (Scamendros) River, each side of which is formed by a fertile alluvial plain where agricultural activities are widely carried out by local villagers. Nevertheless, the area is presently found under the severe effects of environmental pollution due largely to domestic wastewaters, agricultural and industrial activities etc.

In the present paper, Chlorophyll a, b and carotenoid analyses carried out on the leaf samples of polluted and unpolluted plants were compared to determine the level of photosynthetic primer productivy within the selected samples. Our results reveal the fact that the total amounts of Chlorophyll a, b and carotenoid were found to be significantly lower in sampes of polluted plants. It was also observed that the area, which is a preferable place for various migratory birds, is visited by winter migrators Aquila.heliaca and Aquila clanga, which are found under the danger of extinction in global scale according to the IUCN criteria.

Keywords: Environmental Pollution, Industrial activities, Chlorophyll a, b and carotenoid analyses Araplar Gorge, Turkey.

306 - DISTRIBUTION OF BENTHIC MACROINVERTEBRATES IN MANTOVO RESERVOIR (SOUTH-EAST PART OF THE R.MACEDONIA)

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Composition and community structure as well as functional feeding organization on the macroinvertebrates from Mantovo Reservoir (South-East part of the R. Macedonia) in relation to lake depth were carried out during the period from May 2003 to April 2004. Bottom fauna samples were collected at four stations situated on the depth profile across the reservoir: in the littoral at a depth of 2.8 m, in the subllitoral at depth of 6.8 m, and in profundal at depths of 10.2 (upper profundal) and 20.3 m (lower profundal).

Forty nine taxa belonging to 14 animal groups were recorded. With exception on the lower profundal, results of this study show that Limnodrilus hoffmeisteri was the most abundant species in the benthic community. The latter presents taxon highly tolerant to organic pollution, as well as collector (deposit - feeders), witch features indicate presence of abundant fine particulate organic matter (FPOM) in Mantovo Reservoir. Only, zooplankton predator, Chaoborus crystallinus (97.21%) was presented in considerable quantities in the bottom fauna from the deepest part of the lake (20.3 m).

Distribution of the macrozoobenthos was determined by depth gradient, both in quantitative and qualitative terms. The station with the highest richness (d = 3.22), diversity (H• = 1.68), evenness (J(e) = 0.50) and community density (5939.05 ind•m^2) belong to the littoral region and additionally is located near the main river input, which very likely act as colonizing source. Heterogeneous bottom habitat contributes to species richness of macroinvertebrates in the littoral region. In relation to other depth profiles, low species richness (d = 0.99), diversity (H• = 0.17) and evenness (J(e) = 0.08) as well as significant decrease in abundance of zoobenthos community (3313.39 ind•m^2) were noticed in lower profundal, near the dam. These results point up different environmental conditions in the deepest part of the lake.

Keywords: Mantovo reservoir, macrozoobenthos, distribution

307 - A NEW RECORD FROM MACEDONIA: ONOBRYCHIS VICIIFOLIA SCOP.(FABACEAE)

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Onobrychis viciifolia Scop. (Fabaceae) is recorded for the first time for the flora of Macedonia. The genus Onobrychis Miller, is represented in Macedonia (Micevski, 2001) by teen species: O. hypargyrea Boiss., O. gracilis Besser, O. pindicola Hausskn, O. alba (Waldst.& Kit.) Desv., O. degenii Dörfler, O. montana DC. in Lam. et DC., O. arenaria (Kit.) DC., O. lasiostachya Boiss., O. caput - galli (L.) Lam., O. aequidentata (Sibth. & Sm.). While researching the genus, Onobrychis Miller, in Macedonia, a new species of this genus Onobrychis viciifolia Scop., was discovered, which represents a new species of Macedonian flora. Examined specimens: Macedonia: Upper part of the Polog velley: 546 m, 41° 48' N, 20° 55' E, 26 June 2006, A. Haziri and F. Millaku. Total species of Onobrychis Miller in Macedonia reaches 11 with the addition of O. viciifolia Scop.

Keywords: Onobrychis, New record, Macedonia, Fabaceae.

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322 -SPATIAL DISTRIBUTION OF PHYTOPLANKTON IN BABAKAN LAKE, JAKARTA

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Babakan Lake is one of natural lake in Jakarta City, Capital of Indonesia, which has important functions to support lives, such as, water catchment area, fish cultivation and recreation. However, if the environmental aspect are ignored, its quality will decrease with time thus preventing it from performing its function. One way to monitor water quality is by using biological indicators, i.e measuring the presence of phytoplankton in the water. The aims of this research are to study the presence of phytoplankton as bioindicator, with main interests on its diversity, evenness, dominance and saprobites; the result is to obtain significant data on

pollution level of the site types of phytoplankton community. Sample analysis was held in Biology and Microbiology Laboratory, Environmental Engineering University of Trisakti. The phytoplankton samples were taken twice from five observation stations. These are the inlet area, fish cultivation area, center and recreation area, non activity area and outlet area. The result indicated that total of 68 phytoplankton species were found in the first sampling from 4 divisions. In the second sampling, were found 56 phytoplankton species also from 4 divisions. The highest total abundance of phytoplankton was 1091.25 cell/l, the highest evenness index was 0.73, the highest dominance index was 0.70 and the highest saprobites index was 1.03. Based on the range of saprobites index, Babakan Lake is at the categories on lightly to heavy polluted by organic substance.

Keywords: phytoplankton, bioindicator water quality, pollution.

323 - CLIMATE CHANGE IMPACTS ON LAKE BAFA IN MEDITERRANEAN CLIMATE REGION IN TURKEY

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There is increasingly clear evidence of climate change impacts on the aquatic ecosystems of Turkey, especially in the Mediterranean climate region. The strong warming trends in spring and summer and annual minimum air temperatures were recorded in Mediterranean climate regions in Turkey. The lakes are very vulnerable to global warming. The recent records clearly indicates that water level of many lakes decrease dramatically and some of shallow lakes disappeared as the balance among precipitation, evapotranspiration, runoff shifted and increase of groundwater withdrawal as human-induced pressures in Mediterranean climate regions in Turkey. Bafa Lake is a saline coastal lake in delta of Büyük Menderes River in Mediterranean climate region. From biodiversity and fisheries point of view the lake is an important ecosystem. The recent and previous conditions of Bafa Lake were given. The recommendations for the protection of the lake were also given.

Keywords: Bafa Lake, Climate Change, Mediterranean Climate, Turkey

328 - MICROBIOLOGICAL INVESTIGATIONS OF SOME SURFACE SPRINGS AROUND LAKE OHRID AND SUBAQUATIC SPRINGS AT KALISTA DURING DECEMBER 2005 - DECEMBER 2006

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Microbiological investigations of some surface springs (Kalista, Catchment "St. Naum", "St. Bogorodica", "St. Petka", Vilage Elsani, Korita and spring H.B.I.) around Lake Ohrid and the subaquatic springs and Lake water at Kalista were done during December 2005-December 2006. Microbiological investigations included: heterotrophic, proteolytic, amilolytic, lipolytic, facultative olygotrophic bacteria, The most probable number of coliform bacteria,and the Escherichia coli number.

The results received from the microbiological investigations, shows that, in general, all investigated parameters are in range characteristic for all spring waters.

In March, April and December 2006, it is noticed a presence, at all ground springs, of coliform bacteria, which is not typical for clean spring waters. Also in April 2006 it is noticed a presence of a fecal indicator, Escherichia coli, in the water at Kalista, St. Bogorodica and St. Petka, and in December at Kalista, which points on an infiltration of a fecal waste water, a result of an anthropogenic influence.

The water from subaquatic springs was collected on June 29th 2006, at Kalista. Spring No 11, was collected by a sampling Barrel, and Spring No 12, water collected with a sampling bottle, and on December 11th (spring 11 and lake sample). The results received, shows that, in general, it is clean spring water, although, there were noticed some higher values, as a result of mixing the water and fine lake sediment rich with organic matter and bacteria.

Keywords: Lake Ohrid, springs, microbiological parameters

329 - MICROBIOLOGICAL INVESTIGATIONS OF THE WATER AND SEDIMENT FROM THE NORTH-WEST LITTORAL OF OHRID LAKE

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During the period 2005-2006, with seasonal dynamic, a part of the bacterial populations (from ecological and sanitary aspect) in the water and sediment from the north-west littoral of Lake Ohrid was investigated. Investigation were carried out at three localities: Radozda, Livadista and Enhalon (Ezerski lozja). Special attention has been paid to the heterotrophic, proteolytic, amilolytic,and lipolytic bacteria, as well as some coliforms bacteria (total coliforms, E. coli, Cl. Perfringens).

The heterotrophic bacteria constitute the dominant microflora in the lake water and sediment, and on the basis of representation of this bacterial population and according to the categorization of Kohl (1975) water quality of Lake from investigated littoral part belongs to class I and II-III.

Bacterial population densities are higher in the sediment than in the water, with maximum of 11520 bact.ml^{-1} in water and 3180000 bact.cm^{-3} in sediment for the heterotrophic bacteria; 1280 bact.ml^{-1} in water and 618000 bact.cm^{-3} in sediment for the proteolytic bacteria; 790 bact.ml^{-1} in water and 598000 bact.cm^{-3} in sediment for the amilolytic bacteria and 3024 bact.ml^{-1} in water and 377600 bact.cm^{-3} in sediment for the lipolytic bacteria.

Results from sanitary aspect of microbiological investigations suggest an anthropogenic influence, in other words fecal waste sewage pollution. On the basis of obtained bacteriological results, it can be concluded that investigated localities of Lake Ohrid are under different human impact.

Keywords: Lake Ohrid, nort-west littoral, water, sediment, microbiological parameters

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330 -DISTRIBUTION OF SOME REPRESENTATIVES OF EMERGENT VEGETATION IN LAKE OHRID

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The aim of this paper was to determine the distribution of some representatives of emergent vegetation in Lake Ohrid: Phragmites australis (Cav.) Trin ex Steud.

- Common Reed, Typha latifolia L. - Great Reedmace, Typha angustifolia L. - Lesser Reedmace, and Schoenoplectus lacustris (L.) Palla (Syn. Scirpus lacustris L). - Bulrush.

The data for the distribution of these representatives of emergent vegetation in Lake Ohrid we received from the researches performed along the whole Lake's coastline in the territory of Republic of Macedonia (from Radozda to St.Naum).

The obtained results show that there are differences in the distribution of representatives from emergent vegetation between particulars regions of Lake's Ohrid littoral zone. The differences in distribution principally are due to the different ecological conditions in the researched regions, and specific character of particular species.

Namely, Phragmites australis in the upper littoral of Lake Ohrid form a natural discontinuous belt which is distributed from 0 to 5 meters depth. The others researched representatives of emergent vegetation (Typha latifolia, Typha angustifolia, and Schoenoplectus lacustris) were present in the belt of reed, and in particular localities form almost pure associations.

Keywords: distribution, emergent vegetation, Phragmites australis, Typha latifolia, Typha angustifolia, Schoenoplectus lacustris, Lake Ohrid

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331 - DISTRIBUTION OF FAMILY NAJADACEAE IN LAKE OHRID

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In Lake Ohrid from family Najadaceae is present genus Najas L. - waternymph with two species: Najas major All. (Najas marina L.) - Spiny naiad, and Najas minor All. - Brittle naiad.

The data for the distribution of species from family Najadaceae in Lake Ohrid we received from the detailed researches performed in total of 59 localities covering almost the whole Lake's coastline (in the territory of Republic of Macedonia, respectively from Radozda to St.Naum).

The results from the researches show that there are differences in distribution of Najas major and Najas minor between researched localities in Lake Ohrid. The differences in distribution mostly are the results of the different ecological

conditions in the researched localities, and specific character of particular species.

Namely, Najas major was evidenced in the particular localities along North, North-West and South coastline of Lake. There are optimal ecological conditions for its intensive growth and development and it grows in dense populations. This species was present in 20 localities which is 33.90 % of all researched localities along Macedonian shoreline (59). Najas major was evidenced in only 7 localities (11.86 % of all researched localities) where it is rare and grows particularly.

Keywords: distribution, family Najadaceae, Najas major, Najas minor, Lake Ohrid

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338 - COMPARATIVE ANALYSIS OF THE ICHTHYOFAUNA IN THE LAKE OHRID AND LAKE PRESPA

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Lake Ohrid and Lake Prespa are famous lakes in the world and theirs flora and fauna are very interesting. Long time geographical isolation and very long continuity of the existence in the relatively stably climatic conditions mediate that in these two ancient Lakes develop special flora and fauna (include and ichthyological component).

Owing to the uniqueness of those two ecosystems, as well to the theirs permanent care in the past period from the negative anthropogenic influence, in this moment the qualitative composition of the ichtyofauna is stable and quite permanent without the great influence from negative human activity.

Anyway, there existed evident difference in the qualititative composition of the fish population caused by different development of those two ancient lakes what are geographical very near and belong to water shed of the River Crn Drim, but however theirs ichthyologic component is quite various.

Keywords: comparative analysis, ichthyofauna, Lake Ohrid, Lake Prespa

339 - SHAPE CHANGES IN THE EXTERNAL MORPHOLOGY DURING EARLY DEVELOPMENT OF THE OHRID TROUT (SALMO LETNICA KARAMAN, 1924)

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Early ontogenetic shape changes in Ohrid trout were studied, in order to reveal existing patterns in the rates of shape change, in relation to body size. Shifts in growth rates, and thus growth allometries are known to reflect transitions from the endogenous to exogenous feeding. This study relied on a landmark based, geometric morphometrics analysis of nearly 120 specimens from different stages of Ohrid trout. Sampling was done from 25 days post hatching (when about 2/3 of the yolk sack had been absorbed) till 405 days post hatching.

Twenty body landmarks were used as shape descriptors, whereas size was measured using centroid size. To estimate the shape changes during ontogeny, the mean Procrustes distance between all specimens of equal age, for all age groups, was calculated. A relative warp analysis showed that certain aspects of ontogenetic shape changes were not continuous, but indicated the existence of an inflection point during early ontogeny. The shape changes were mainly related to allometries in the head, caudal peduncle, and the ventral abdominal profile.

Keywords: body shape; ontogeny; morphometrics; Salmonidae

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342 - MONITORING OF THE PHYSICO - CHEMICAL FEATURES OF THE SURFACE WATER IN OHRID LAKE IN THE PERIOD 2004 - 2006

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According to the Programe of monitoring of surface waters in the Republic of Macedonia, Republic Institute for Health Protection had processed the samples of the water from Ohrid lake.The samples are taken near the shore at the depth

of 1,5 m under the surface.

In addition of consumption of BOD, conductivity, NH_3,NO_2 and NO_3 , examine aniones and cathiones, as well as heavy metals Ohrid lake is classified as first class according the registered values.

Keywords : hydrology,water quality ,ecology,

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347 - BREEDING-RELATED CHANGES IN SPLEEN MACROPHAGE METRICS IN OHRID TROUT (SALMO LETNICA, KAR.)

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Macrophage aggregates are primary phagocytic cells, generally encountered within the reticulo-endothelial supporting matrix of haemopoietic tissues. They have been used as non-specific biomarkers of physiological stress due to exposure to environmental contaminants. Environmental contamination can provoke alterations in macrophage aggregates metrics (number, size or percentage of tissue occupied), so in the last 20 years they are successfully used in a number of monitoring programs. But, what natural factors such as gender, aging, nutrition and even seasons can also influence those cells.

Relying on the above-mentioned arguments, the objectives of this study was to estimate breeding-related changes in the number and size of the spleen pigmented macrophage aggregates in wild Ohrid trout females. The data show that diameter of macrophages slightly decrease from pre-vitellogenesis until late vitellogenesis and afterwards increase, while number of macrophages are constantly increasing from early vitellogenesis until post-spawning period. However, both size and number of spleen pigmented macrophages significantly increased in spawning and/or post-spawning period. These results confirm our pervious ones that breeding cycle has to be taken in consideration, especially when spleen macrophage aggregates are used as pollution indicators.

Keywords: spleen, macrophage aggregates, Ohrid trout, breeding cycle.

356 - COORDINATED WATER RESOURCES MANAGEMENT OF PRESPA LAKES AT TRANSBOUNDARY LEVEL, ACCORDING TO THE EUROPEAN WATER FRAMEWORK DIRECTIVE

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The Prespa Lakes suffer from serious deterioration of their habitats, the Macro Prespa Lake has shrunk, the Micro Prespa has been silted and the use of the water is extensive. Close co-operation between the countries sharing the Lakes is a prerequisite for sustainable management of water resources in the region and to ensure the international community's support for their sustainable management. Human activity in the catchment area of the Prespa Lakes covers fishery, tourism, industry, agriculture, forestry, and urbanisation, all of which means disruptive or polluting consequences for the Prespa Lakes.

From past to present the handling of water resources in the area of the Prespa Lakes was and still is mostly driven by actual day-to-day needs and technical possibilities of each of the riparian parties and countries. A water management that follows the general of European Water Framework Direktive criteria has not yet been established. To date only general objectives and goals for the management of the Prespa water resources have been defined and agreed upon by the three countries.

Consequently it might be concluded that the water resources are being exploited rather than managed.

Management of transboundary waters is a complex issue, which has to overcome many challenges in order to achieve its environmental objectives. The purpose of transboundary co-operation, however, is not only to preserve international water objects and the unique natural conditions of their environment, but also to secure the interests of all parties as well as the interests of local residents in the border region.

To find a common approach to the governance of transboundary waters is further complicated by differing legislation, water management practices, institutional structures, languages and cultures of the bordering countries. Nevertheless, co-operation in managing the quality and quantity of transboundary water bodies also presents an opportunity from which all of the parties involved can benefit.

The new European water policy, the Water Framework Directive (WFD) that came into force in 2000 and is based on a river basin approach, addresses the issue of transboundary cooperation not only across the EU member state borders, but also beyond.

The Prespa Lakes form a transboundary water body shared by Albania, Greece and the Republic of Macedonia. By virtue of Greece being an EU country and the Republic of Macedonia and Albania not being association countries as of yet, the Prespa Lakes form the border between the EU and non-EU, i.e. Albania and the Republic of Macedonia.

Being the largest international water body on the Balkans, the Prespa Lakes are very important for the region. So far no agreements have been formulated between the three countries regarding the specific requirements of water management of the Prespa Lakes, nor has a Joint Transboundary Water Commission responsible for the preparation of such an agreement been established. However, a Tripartite Agreement on the Protection and the Sustainable Development of the Prespa Park Area is being prepared, which partly addresses water management issues.

Water is the key element of life. Water resources management is necessary to protect water streams and water bodies from misuse by overexploitation and pollution as well as to protect property and lives, e.g. from inundation and flooding or from droughts. Appropriate water resources management is one important precondition for sustainable economic development under adequate environmental conditions.

In view of the legal and geographic situation, it is suggested that the future water management of the transboundary Prespa basin be set up in the spirit of, and according to the requirements of the Water Framework Directive of the European Union. In addition, water management should follow the "Dublin Principles" and other conventions relevant for the area.

It is suggested that the national Governments of Albania, Greece and the Republic of Macedonia establish a "Transboundary Prespa Water Commission" (TPWC). This body should represent the interests of the three countries as well as those of the local communities and of the relevant NGOs of the Prespa Catchment. At the beginning, the TPWC should be responsible for the formulation of a basic agreement on water management of the Prespa Lakes. After acceptance of the agreement, TPWC could become the tripartite body that would be responsible for coordination, control and supervision of the implementation and execution of the water management plan.

To fully comply with these requirements, the TPWC should be set up as a body with strong water resources competence to cooperate with and to direct the national territorial authorities with respect to water-related issues. The elaboration of a water management plan requires the definition of respective objectives and practical principles that can also be understood as work steps or guidelines. To assist and accelerate the necessary debate, 19 practical principles for a Transboundary Prespa Water Management Plan are proposed.

357 - SEASONAL SUCCESSIONS OF ZOOPLANKTON IN THE PELAGIC ZONE OF LAKE PRESPA DURING 2004-2006

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The changes of the Lake morphometric parameters as result of the great natural and anthropogenic influences have negative impact on the littoral region as first and on the water quality at whole, too.

The zooplankton representatives are important part of the trophic pyramid in all kind of water basins and they are important ring in the production of the freshwater ecosystems.

In this report the situation with zooplankton in the pelagic zone of the Lake Prespa during 2004-2006 is presented. During the period of investigations the variations in the zooplankton density were noted. Higher maximums the total zooplankton reached during the summer and autumn period and the highest peak was registered in June 2006.

The species of the subclass Copepoda were dominant during the all investigated period, especially the larval and kopepodid stages which were presented with great numerical values.

The recorded changes related to biotic diversity as to zooplankton quantity showed certain changes in the Lake Prespa pelagic water.

The obtained results are important and they give opportunity to take the measures for lake protection in time.

Keywords: Lake Prespa, pelagic zone, zooplankton, dynamic

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364 - NUTRITION AND GROWTH OF CARASSIUS AURATUS (LINNAEUS, 1758) FROM RESERVOIR STREZEVO (REPUBLIC OF MACEDONIA)

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The work presents data of diet, length and weight growth rate, the absolute and relative growth of fishes, velocity and the characteristic of growth of the species

C. auratus of the reservoir Strezevo. The analysis of the digestive tract shows that C. auratus is omnivorous and it's diet varies a little bit or not at all from the diet of its close relative C. carassius. The digestive content shows presence of animal and plant components in different quantities. The dominant food is the fauna of the bottom, zooplankton organisms, especially representatives of the big Cladocera and Copepoda. Furthermore the stomach content has Rotatoria (Keratella sp.), but in obviously lower quantities. The insects also take significant place in nutrition components of C. gibelio. It was found a high level presence of detritus as the main component of the plant nutrition and together with the algae of the family Bacillariophyta and seeds of the terrestrial plants. There was also found a roe of other species fishes, particularly in the intestine content of the exemplars caught in the spring season.

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369 - TRANSBOUNDARY LAKES IN THE BALKAN AREA, MONITORING AND MANAGEMENT IN ACCORDANCE WITH THE EC WATER FRAMEWORK DIRECTIVE

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On the Balkans thirteen river basins are transboundary, i.e. shared between two or more countries. This illustrates the high relevance of developing appropriate management tools and policy strategies tailored to address transboundary water resource issues in this region. The DRIMON Project (www.drimon.net) seeks to improve the framework for integrated land and water resource management in transboundary catchments, with particular emphasis on erosion and sedimentation, pollution control measures and related transboundary problems, in line with the EC Water Framework Directive (WFD). The main objective is to contribute towards an improved knowledge base and dialogue between stakeholders for the transboundary management of water resources in the Balkan area through the integration of natural and social sciences.

This paper presents the results of the first half of the project (entire project period, 2006-2009), with particular emphasise on transboundary water management needs for improved frameworks. Lake and river monitoring results from the

Prespa and Skadar/Shkodra basins are presented and seen in conjunction with experiences in the basin of Lake Vansjo in Norway. Stakeholders analyses in the two case basins will provide insights into the main problems and ways to overcome them through improved participation and knowledge sharing.

Keywords: Nutrient budgets, Dose-response relationships, Monitoring, Transboundary management of water resources, Stakeholder analyses.

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372 - THE REGIME OF WATER LEVEL OF LAKES DURANKULAK AND SHABLA

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This paper presents the results from analyses of water regime of Lakes Durankuk and Shabla, which are the best-preserved coastal wetlands in Bulgaria with international importance. The lakes are Ramsare Convention Sites. Their water balance and regime are different. `The water balance of Lake Duranculak include: groundwater - 9,2 mln. m³/an (79%), precipitation - 2 mln. m³/an (17%), surface water - 0,5 mln. m³/an (4%); flow to Black sea - 7,1 mln. m³/an (61%, evaporation - 2,2 mln. m³/an. (20%), transpiration - 2,3 mln. m³/an (19%). It's the reason for a small fluctuation of water level - the amplitude is just 36 sm. The annual level is between 27,5 and 71,2 sm and coefficient of variation is 0,82. The high water is from January and June, the law water - from July till October. The water balance of lake Shabla is: groundwater - 20,6 mln. m3/an (95%), precipitation - 0,7 mln. m³/an (3%), surface water - 0,44 mln. m³/an (95%), flow to Black sea - 18,5 mln. m³/an (87%), evaporation - 0,81 mln. m³/an. (4%), transpiration - 1,9 mln. m³/ an (9%). The annual amplitude is 87 sm and its more then amplitude of Lake Durankulak. The regime of water level includes: high level - from January till June, law level - between July and September and middle faze - October-December.

Keywords: lake, wetlands, water regime

374 - A COMPARISON OF VERTICAL AND SEASONAL DISTRIBUTION OF CHLOROPHYLL A IN LAKES OHRID AND PRESPA

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Considering the hydrological connection of Lakes Ohrid and Prespa, the two biggest lakes in R. Macedonia, comparative investigations of the chlorophyll a content were carried out as the most sensitive indicator of changes on trophic conditions in the lakes.

The goal of this research was to obtain information about the rate of change in their trophic state as a consequence of the anthropogenic influence and decline in the water level of Lake Prespa. The investigative period of this study took place over the years 2001, 2002, 2003.

According to the results obtained during these investigations, chlorophyll a content and phytoplankton biomass in Lake Prespa were 6 times higher than in Lake Ohrid during 2002 and 9.5 times higher during 2001 and 2003.

The average annual chlorophyll a content for the investigated water column of Lake Ohrid was lower from 1 $\mu g\ l^{-1}$, with the lowest value in 2003 (0,52 $\mu g\ l^{-1}$), in 2002 the value was a little bit higher (0,74 $\mu g\ l^{-1}$) and in 2001 reached 0,97 $\mu g\ l^{-1}$. In Lake Prespa the highest average annual chlorophyll a content was registered in 2001 (9.27 $\mu g\ l^{-1}$), in 2002 the value was lower (4.68 $\mu g\ l^{-1}$) and in 2003 reached 5.04 $\mu g\ l^{-1}$.

The chlorophyll a content in Lake Ohrid reached the highest values in the spring period and significantly decreased in the summer period when were registered the lowest values. Especially low values were registered in the surface layer. The seasonal distribution of chlorophyll a content In Lake Prespa was opposite than in Lake Ohrid with the highest values in the winter and in the summer period.

The highest chlorophyll a content in Lake Ohrid was registered in the layer between 20 and 40 m depth. Contrary to Lake Ohrid in Lake Prespa the chlorophyll maximum was observed in the surface layer and 5 m depth and with increase of the depth the chlorophyll a content decreased.

Differences in the seasonal and vertical distribution of chlorophyll a and anyhow the values of this photosynthetic pigment in Lakes Ohrid and Prespa were result of the different trophic state of the lakes.

According to the results of this parameter obtained during these investigations, it was determined that Lake Ohrid was in an oligotrophic state without clearly visible

signs of eutrophication. The pelagic zone remains immune to the anthropogenic pressures that threatened these waters in previous decades. In contrast to Lake Ohrid, Lake Prespa was in mesotrophic state and in summer period 2001 in eutrophic state with clearly visible signs of eutrophication.

Keywords: Lake Ohrid, Lake Prespa, pelagic zone, trophic state, chlorophyll a

TOPIC 7

HYDROLOGICAL MODELLING

016 - IMPACT OF HYDROLOGIC UNCERTAINTIES IN RESERVOIR ROUTING

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Reservoir routing methods are used in the design and operation of storage facilities at high flow conditions. Traditionally, deterministic approaches have been used for reservoir flood routing computations, which do not account for possible variations in governing parameters. However, hydrologic variables, such as inflow, stage, and outflow may naturally have various sources of uncertainties. For example, for the same water level in the reservoir, different outflows may occur mainly because of progressive reservoir sedimentation. Since important dimensions, such as dam height and spillway size, are normally dictated by reservoir routing performed under design flood conditions, use of precise statistical information on governing hydrologic variables is of utmost importance in view of safety and economy.

In this study, variations in hydrologic parameters that are utilized in reservoir flood routing are discussed in a case study with a flood detention dam. Collection of necessary information, such as the area-elevation-volume relationship of the reservoir, characteristic dimensions of the structure is the first step of this study. Furthermore, the associated probability density functions and coefficients of variation of the parameters involved in routing computations are investigated. Within the scope of this study, statistical parameters of inflow, outflow, and reservoir water level are investigated through Monte Carlo analysis. Additionally, a sensitivity analysis is conducted to assess the effects of possible variations in hydrologic parameters.

Keywords: Hydrology, Uncertainty, Reservoir Routing, Monte Carlo Analysis

020 - TECHNIQUES OF IRREGULAR WAVE ANALYSIS IN SCOPE OF TIME SERIES

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A time series has been defined as a sequence of measurements arranged in chronological order. Such time series require amplification. A time series must describe the changes occurring in a variable over time. It constitutes a summary of the effect of the factors bearing on the data being studied. It consists of pictures as a continuum of change. Passage of time occurs in nearly every set of statistical data; yet in studies outside the time series field the time element is eliminated or minimized. Without time series analysis, engineers often face situations in which they must design structures and produce drawings for construction with minimal background information on the site and limited reliable theoretical considerations for calculation. In this research an application of extended time series analysis of waves will be given with bottom boundary layer and sediment transport phenomena.

Keywords: Irregular wave analysis, time series, wave recorders

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027 - PREDICTION OF SATURATED HYDRAULIC CONDUCTIVITY USING SOME MOISTURE CONSTANTS AND SOIL PHYSICAL PROPERTIES

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Saturated hydraulic conductivity (Ks) is an important variable in all models that deal with the hydrological cycle. Determination of Ks in soils is a difficult and time consuming process. The objective of this study was to determine saturated hydraulic conductivity in soils by pedotransfer (PTF) models derived using some moisture constants and soil physical properties. Saturated hydraulic conductivity values were determined in 30 different soil samples using constant head

permeability method. According to path analyses results, direct effects of some soil properties on Ks in soils were in the following order; permanent wilting point (PWP) > bulk density (BD) > clay (C) > silt (Si) > field capacity (FC). Soil physical properties generally had the highest indirect effects on Ks through PWP. Saturated hydraulic conductivity predicted by the second order PTF models was highly significant using only C, Si and DB (r=0.868) and using only moisture constants, FC and PWP (r=0.796) in the models. Using moisture constants with the other soil physical properties in the second order PTF model increased significance level of the relations between predicted and measured values of Ks (r=0.955). Besides soil physical properties, having moisture constants in PTF models showed that saturated Ks values can be predicted more accurately in soils.

Keywords: Saturated hydraulic conductivity, pedotransfer model, soil physical properties, field capacity, wilting point.

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032 - STREAMFLOW SIMULATION USING RADAR-BASED PRECIPITATION DATA APPLIED TO THE ILLINOIS RIVER BASIN IN OKLAHOMA, USA

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This paper describes the application of a spatially distributed hydrological modelWetSpa (Water and Energy Transfer between Soil, Plants and Atmosphere) using radar-based rainfall data provided by the United States Hydrology Laboratory of NOAA's National Weather Service for a distributed model intercomparison project. The physically-based continuous hydrological model uses remote sensed and GIS data in order to simulate and predict hydrographs at the basin outlet or any converging point in a watershed. The model is applied to the Illinois River basin above Tahlequah hydrometry station in Oklahoma with a 30-m spatial resolution and 1-hour time-step for a total simulation period of 6 years. Rainfall inputs are derived from radar. The distributed model parameters are based on an extensive database of watershed characteristics available for the region, including digital maps of DEM, soil type, and landuse. An automated calibration scheme is employed to the WetSpa model to tune and adjust the global model parameters. The simulated hydrograph shows a good correspondence with the observed hydrograph indicating that the model is able to simulate the relevant hydrologic processes in the basin.

Keywords: WetSpa, Physically-based Distributed Hydrological Model, DMIP, NEXRAD Stage III rainfall data, Streamflow Simulation, Automated Calibration, PEST, Illinois River basin.

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034 - UNMEASURED HYDROLOGICAL DATA ESTIMATION BY ARTIFICIAL INTELLIGENCE METHODS

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The interest of the water engineering, water recourses management and planning has become more important by the increase of the water consumption.

It is very important to get the correct and complete information about the river on which the project of the construction done. Artificial intelligence tecniques are often and successfully used to complete the unmeasured data estimation and the predicted river data. In this study, feed forward back propagation neural networks, generalized regression neural network, fuzzy logic and regression analysis are modeled for unmeasured data estimation and the predicted river data by using the data of the four runoff gauge station on the Birs River in Switzerland. In the comparison of the performance of these models, the best proper model are searched by using the mean square error, determination coefficients and efficiency coefficients.

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062 - DISTURBED RIVER CORRIDORS AND PROTECTION MEASURES

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Integrated water resources management addresses issues of human security and sustainable development. Human security and well-being are closely related

to maintaining ecosystems and avoiding environmental degradation. The concept of sustainable development is embedded to human security, which encompasses the physical security of individuals and communities, but also economic security, flood security, health security, environmental security and political security. The relationship between human security and the environment is most pronounced in areas where human dependence on access to natural resources is greatest. This paper will present a case study of disturbed river corridor and proposed restoration measures for its protection.

The case study is Lepenec River corridor in the area of the bridge on Skopje Bypass Motorway. The Lepenec River as a central part of the neighboring settlements plays an important role. The bridge and the alignment of the highway are crossing the river valley almost perpendicular that impact flood and environmental management. Flood analysis with bridge modeling has been carried out, and some protection measures have been proposed. The erosion processes will be discussed with special attention to riverbed and accompanying trees and bushes which are emphasizing the character of the river corridor itself.

Keywords: river corridor, flood, hydraulic analysis, erosion, protection measures

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066 - A HIDDEN MARKOV CHAIN FOR THE ORSOVA DISCHARGE LEVEL IN SPRINGTIME

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A hidden Markov model (HMM) with 7 states is applied to spring daily discharge at Orsova. States 1 and 7 can be interpreted as extreme events, namely hydrological severe drought and respectively discharges more above normal (possible flood). For the period 1958-2001 the Orsova discharges are analyzed in associated with sea level pressure (SLP) over Atlantic- European region (ERA-40).

The highest correlation between SLP (with 10 days before) and discharges has been found in a key point (47.5N; 20E). Taking into account the values in this key point, atmospheric circulation was classified in three states (C-cyclonic, N-normal and A - anticyclonic).

The probabilities of emission matrix, which associated observations with HMM states are calculated. The highest probabilities for state 1 of HMM are associated

with symbol A and for states 6 and 7 with symbol C.

By means of transition matrix of HMM and of emission matrix, a sequence of 1000 values for states of HMM and for observation symbols was generated. After that, the posterior state probabilities for state 1 and 7 for 100 steps have been estimated.

The simulations of states of the hidden Markov model and of the atmospheric states, lead to an improvement of the information on the sequences of states in the Danube lower basin, associated with atmospheric circulation.

Keywords: Extreme events, Danube low basin, atmospheric circulation

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085 - HYDROLOGY SIMULATION OF THE VARDAR RIVER

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The last previous water resources study of the Vardar river basin was completed in 1996. To update the study, flows for the Vardar to Gevgelia were simulated for the period 1961 to 2005.

Data for the study came from the Macedonia Hydrometeorological service and the previous study. We were informed by the Macedonian hydrometeorological service that the data set for the previous study had not been rigorously quality controlled. Additional quality control check were carried out. These included visual checks of long term data (which identified major anomalies) and double-mass plots, which checked for long-term consistency of data.

Data provided included daily river flow, precipitation and temperature and monthly values of humidity, wind speed, and sunshine. Whilst this study had data for recent years, the number of stations available for analysis was fewer than the previous study. Every attempt has been made to maximise the usefulness of this data by using advanced infilling techniques to extend the incomplete data.

Data on abstractions from and discharge to the rivers were also provided but these were much less complete.

To infill the flow records and extend them to the year 2001, rainfall/runoff modelling was used. The model used, HYSIM, is extensively used in the UK

and elsewhere. Given the importance of snow fall and melt this aspect of HYSIM was improved during the study. The accuracy of the simulation for upstream stations was constrained by the availability and accuracy of the data. However for downstream stations, where upstream data were available, the accuracy was very good. A flow record for the period 1961 to 2005 was provided for the Vardar and its major tributaries.

Keywords: hydrology, simulation, snow melt, optimisation, model, transboundary

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089 - REGIONAL MODELS AND METHODS FOR UNGAUGED BASINS

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There are several approaches for a calculation of design floods at ungauged site: using of deterministic precipitation-runoff models or DEM (digital elevation models), using of the information on the nearest analogue-site, using models of watershed descriptors or mixed approaches. In this paper empirical-statistical modeling havs been applied for a development of simple regional models which connect a design flood directly with the watershed descriptors: a slope, a basin area, an average elevation and other. These simple models can be only one tool for area with sparse hydrometeorological network and for water projects connected with a calculation of design floods for many rivers and, for example, for oil-gas pipelines.

Approach of empirical-statistical regional modeling includes the following main stages:

- choice of homogeneous region and water basins with wide range of watersheds' descriptors;
- assessment of homogeneity and stationarity of observed time series;
- restoration of long-term time series on the basis of relationships with the longest records on the analogues sites;
- assessment of homogeneity and stationarity of restored time series;
- calculation of design floods for each site of observation;
- development of regional models;
- assessment of efficiency of regional models on the basis of remainders analysis.

This approach has been applied for development of regional models for annual maximum and maximum of snowmelt floods for central region of Russia which includes territory of the Upper Volga and the Msta River with 50 river basins. The procedure of a development of effective regional model includes: assessment of kind of simple regression between response (runoff) and each factor for aim of its functional changes; choice of a structure of a model; assessment of the model's coefficients and analysis of remainders on the basis of depend and independent data. Statistical criteria have been applied for assessment of one-factor dependences and non-linear function (log-function) has been effective for basin area only. Three structures of a regional model have been used: reduction formula, additive equation and multiply structure, which include a joint effect of two factors together. Averaging of remainders has been suggested as an additional tool to increase model efficiency.

As a result the best regional models have been obtained in case of multiply structure with 2-3 main factors and with correlation coefficients R=0.83-0.87. Standard deviation of remainders on the basis of dependent and independent data is practically the same and equal 25-30% that is suitable for such class of empirical-statistic regional models.

Other methods such analogies, space interpolation and space modeling are discussed too. The general classification of regional methods are given.

Keywords: ungauged basins, regional models, design floods, efficiency.

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129 - THE IMPACT OF CLIMATE CHANGE ON NUTRIENT FLOWS IN THE CATCHMENT OF RIVER KOKEMÄENJOKI

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Climate change will have impacts on nutrient flows from catchments. Modelling approach was used to quantify these effects on a regional scale. The Rossby Centre coupled Regional Climate Model (RCAO) was used for the discharge simulations. The boundary conditions were taken from two Global Climate Models (Hadley Centre HadAM3H and Max Planck Institute für Meteorologie ECHAM4/ OPYC3) and emission scenarios (A2 and B2) from the IPCC's Special Report on Emissions Scenarios (SRES). The modelling system consists of three parts: a runoff model, a nutrient transport model and a river-lake model. The study area, the Kokemäenjoki river basin, is the fourth largest catchment in Finland, with a

total surface area of 27 000 km². Nutrient loading was modelled in the area that cover 26% of the entire basin which was considered to have the major impact on nutrient loading. According to the scenario simulations, the seasonal dynamics of the nutrient loading will change. Annual loading sums will increase regardless of the climate model or the emission scenario used.

This work was carried out within "Developing Policies & Adaptation Strategies to Climate Change in the Baltic Sea Region" (ASTRA) project which was co-financed by the Baltic Sea Region's INTERREG III B Program of the European Union.

Keywords: Modelling, Nutrients, Loading, Climate Change, ASTRA.

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151 - DROUGHT EARLY WARNING SYSTEM IN ITALIAN RIVER BASIN USING HYDROLOGICAL MODEL AND SATELLITE IMAGES

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The research presented in this paper, has been carried out by LaMMA-CRES laboratory for the fulfilment of the INTERREG IIIB MEDDOC Project HYDRANET.

The HYDRANET project has focused on the management of the hydrological resources of the Mediterranean Basin, in order to develop strategies and instruments able to assess the risk of desertification. With a series of studies and pilot actions, the project proposed the creation of a network for the long-term programming and durable management of the hydrological resources in the Mediterranean basin with particular concern to the drinking water supply and the multiple use and re-use of water.

In particular the Region Toscana, with the technical and scientific support of LaMMA-CRES, has implemented a hydrological model for the assessment of the water balance of the Ombrone River catchment (Southern Tuscany) through NDVI analysis, in order to detect particular drought sensitive areas.

The outcome of the study demonstrated a good correlation between the hydrological model results and the NDVI analysis, confirming that the photosynthetic activity of the vegetation is strictly connected to the hydrological parameters of a catchment. Therefore, considering that the use of remote sensing techniques with the analysis of the satellite images gives good quality information on drought phenomena, a calibrated hydrological model allows to quantify the drought effects on natural

ecosystems, on agriculture and on the water availability in the rivers.

The applied methodology revealed to be an efficient analysis and monitoring means of the hydrological deficit.

Keywords: Hydrological Model, Remote Sensing, Drought, NDVI, MODIS.

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153 - REAL-TIME DATA AQUISITION FOR WATER QUALITY MODELING IN RIVER BASIN WATER COURSES

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The document, "Framework Directive on Waters " (Directive 2000/60/EC, 2000 introduced new principles and standards in creating and realizing the policy of sustainable usage of waters and water protection. Considering the complexity of the issue, mathematical models are becoming increasingly important for implementation of the Framework Directive on Waters, especially in the part of water protection from pollution and management of water resources quality in the river basins. Of course, models should be used with care, that is, the user needs to understand the assumptions and information used for production and calibration of the mode. Properly developed and used, the model can produce efficient platforms for analysis, understanding and discussion, with an aim of supporting the decision.

Mathematic modeling must be preceded by significant field investigation works which are the basis of any successful simulation and forecast of river water quality. Recording quality of river and waste water must be conducted according to the profiles defined in advance and when taking samples, the pollution propagation must be taken into account. Investigation works must include flow rate, flow velocity rate, and water quality analyses, both of physico-chemical parameters, and the bacteriologic and biologic parameters. It is very important that the survey (investigation works) include various hydrologic cycles, as well as all the quantitative and qualitative variations at the outlets of polluters. Investigation works must be carried out in such a way that the results of field investigations can be used for calibration and verification of the model.

Contemporary engineering practice has seen the usage of the concept " real-time

water resources system management". This approach differs from the traditional methods of management, and comprises usage of historical and running data bases, "SCADA" systems, memo-regulation equipment, and hydrologic hydraulic and management models for prediction of system status and management scenarios. Such solutions would, immediately after their introduction, result in significant improvement, and in the long run would represent a rational approach of solving the complex water protection problem and water quality management in the river basin.

Acquisition of data for the development of model on one hand and management in real time on the other, requires development of the continuous water quality monitoring system, and water quality monitoring in real time. This paper presents an advanced system of water quality monitoring, which is developed in the framework of the scientific projects at the Faculty of Civil Engineering and Architecture of Nis, through application of contemporary technologies such as GPRS data transfer in real time from the remote measuring stations to one center, where the data can be used for modeling purposes and decision making purposes with an aim of integral protection of water resources in the river basin.

Keywords: water quality monitoring, water quality management, on-line distance measurements

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164 - STOCHASTIC DOWNSCALING OF DAILY PRECIPITATION OVER THE TERRITORY OF BULGARIA BY MEANS OF HIDDEN MARKOV MODELS

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Various stochastic downscaling techniques have been developed to overcome the inability of general circulation models and limited area models to reproduce observed local daily precipitation. In the present study we fulfil this task using the non-homogenous hidden Markov Models (NHMMs). The NHMM links large-scale atmospheric patterns to daily precipitation data at a network of rain gauge stations, via several hidden (unobserved, latent) states called the "weather states". The evolution of these states is modeled as a first-order Markov process with state-

to-state transition probabilities conditioned on some indices of the atmospheric variables. Due to these weather states the spatial precipitation dependence can be partially or completely captured.

Various NHMMs are used to relate daily precipitation at 30 rain gauge stations covering broadly the territory of Bulgaria. At each site a 40-year record (1960-2000) of daily precipitation amounts is modeled both in its occurrence and intensity components. The atmospheric data consists of daily sea-level pressure, geopotential height at 500 hPa, air temperature at 850 hPa and relative humidity at 700 hPa (subset of NCEP-NCAR reanalysis dataset) on a 2.5° x 2.5° grid covering the Europe-Atlantic sector 30°W-60°E, 20°N-70°N for the same period. The first 30 years data are used for model fitting purposes while the remaining 10 years are used for model validation. Detailed model evaluation is carried out on various aspects. The results show that the downscaled simulations reproduce well the observed precipitation probabilities, amount distributions, wet and dry spell length distributions.The identified weather states are found to be physically interpretable in terms of regional climatology. A comparison is also made between the NHMM and classical at site two-state first-order non-stationary Markov stochastic daily precipitation model, conditional on a summary of 5 pseudotemps (based on all atmospheric variables in NCEP-NCAR reanalysis dataset) surrounding the territory of Bulgaria.

Keywords: Hidden Markov Models, Precipitation Modelling, Statistical Downscaling

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217 - OPERATIONAL HYDROLOGICAL FORECASTING SYSTEM FOR THE MANAGEMENT OF RESERVOIR CASCADE ON THE ARDA RIVER IN BULGARIA

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The paper presents a recently developed operational hydrological forecast system for the purpose of the Arda River's dam cascade management. Arda river basin covers about 5000 km² in southeast Bulgaria and represents a real challenge for hydrologists because of his highly irregular flow. The paper describes the geographical conditions, the climate and hydrological regime of the basin. The modeling and forecasting process is presented with its four parts: real-time data collection, short-range high-resolution meteorological model - Aladin, coupled

surface scheme and distributed hydrological model ISBA-Modcou. The entire system, as data driven software cascade, is depicted separately. The results from the first operational year and the figures of the similarity of the forecasted against the measured streamflow are also presented.

Keywords: Hydrological modeling, Hydrological forecasting, Risk Management.

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220 - MODELING AND CALCULATION OF FLOODS PRODUCED BY FAILURE OF LINEAR STRUCTURES FOR DEFENCE AGAINST FLOODING

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In the present study are defined the linear systems for defense against flooding for which are possible more scenarios of failure, resulted by failure combination of the component of defence against flooding structures, which determines floods. The total probability of inundation is calculated taking in consideration all possible failure scenarios for the defense against flooding lines.

It is presented a methodology for simulation, modeling and calculation of accidental floods, taking into account serial, parallel ore mix defense linear system, both structures by draining, as by infiltration.

Finally for each analyzed variant it is established the anticipation period for maximum risk, the period witch the objectives affected, area of inundation (in time).

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244 - INFLOW SIMULATION IN YOVKOVTZI RESERVOIR

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Natural inflow determination in reservoirs is an important water-economy task related to regulated water distribution and the rate of satisfaction of all water users from the reservoir.

The application of hydrological models is up-to-day approach for natural inflow simulation in reservoirs on the base of climatic, physical-geographical characteristics of the watershed, soils, land use, relief, etc.

A research for natural inflow simulation in Yovkovtzi reservoir is carried out with the application of the hydrological model BISTRA (Basin Impacts of Simulated Transport from Rural Areas), developed in ArcView on the base of GWLF (Generalized Watershed Loading Functions) as a result of international collaboration between the Pennsylvania State University and the Institute of Water Problems, the Bulgarian Academy of Sciences with the financial support of the NSF-USA.

Yovkovtzi reservoir is situated in the upper flow of the Vesselina river, a tributary of Yantra river. It was built with the aim for water supply of the settlements in the Yantra river basin. The reservoir has a total capacity of 92,2 mln. m^3 and watershed area 218 km^2. The mean watershed elevation is 598 m where the range of its change is from 280 m to 1205 m. The watershed of the reservoir is characterized with the deciduous and coniferous forests.

The study includes a presentation of all the necessary for the hydrological model digitized maps for the reservoir watershed in GIS layers. Two variants for the determination of the daily precipitation of the watershed for the period of study are used - with the "grid" interpolation procedure and by means of a choice of a representative for the watershed main meteorological station from the national monitoring net.

The simulated hydrograph of the monthly reservoir inflow and of the measured inflow for the period 1986-1995 have been presented and analyzed together with statistical assessment of the received hydrological rows. Conclusions and recommendations have been given.

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259 - HYDROGRAPH ANALYSIS USING STABLE ISOTOPES IN A MICRO SCALE BASIN

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Spatial and temporal distributions of precipitation show quite a variation in different regions of Turkey. In general, amount of precipitation is low in the central part of the country. It is necessary to store water to prevent drought as the precipitation is lower than expected. Should excess precipitation occur in the short term, basin management and flood control structures must be considered to prevent

floods. In this situtation it is necessery to know the hydrologic properties (such as precipitation, runoff, evaporation) to obtain long term economic water storage structures.

In this research, a stable environmental isotope study was carried out from analysis of water samples collected from rainfall, runoff (total discharge), springs (subsurface flows), and wells (groundwater). The research site was Güvenç basin located near Yenimahalle-Ankara having a drainage area of about 16.125 km². The aim of the study was to investigate rainfall-runoff relationship for Güvenç basin using stable isotope method in the separation of hydrographs. Recorded total discharge hydrographs are separated to their components using isotopes (oxygen-18, deuterium) contents. Among these samples, unit hydrographs from two single-peaked storm hydrographs were derived using both isotope and graphical (Barnes semi-log) methods and the derived unit hydrographs' peaks were compared. It was found out that the contribution of subsurface flow originating from various sub layers of the basin are important in hydrograph separation using isotope method of approach.

Keywords: Rainfall-runoff, hydrograph separations, stable isotopes, Guvenc

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276 - MEASUREMENTS AND MODELLING OF RAINFALL INTERCEPTION AND SOIL EROSION PROCESSES ON THE DRAGONJA EXPERIMENTAL RIVER BASIN

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The Dragonja experimental river basin was established in late 1999. The area belongs to the sub Mediterranean climate region and it is geologically composed on Eocene flysch. The region is interesting because in the last few decades it has been subjected to intensive natural reforestation as a consequence of discontinued agricultural land use. This has caused a decrease in minimal and maximal river flows while no noticeable precipitation and temperature changes have been perceived.

Measurements of the individual components of the forest hydrological cycle are performed on two forest plots in the deciduous forest above the confluence of the Dragonja and Rokava rivers. On the basis of the measurements and water balance equation it was calculated that more than one fourth of the precipitation falling above the forest evaporates back to the atmosphere. Similar results were also obtained with different models of interception.

On the southern slope of Marezige village eight 1-m2 experimental plots are installed for performing interrill soil erosion measurements on surfaces with different land use types: on bare soil, in an overgrown meadow and in the forest. The measurement results show that only few major erosive events are responsible for the greater part of the washed soil. Interrill soil erosion in the overgrown meadow and in the forest is strongly connected to the vegetation period when the most intensive erosive events occur.

Keywords: forest hydrological cycle, rainfall interception, soil erosion, flysch, Dragonja.

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280 - AN ATTEMPT FOR YANTRA RIVER FLOX MODELLING

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The Yantra river basin is situated in the central part of the Northern Bulgarian territory. The river flows from South to North from the Stara planina mountain up to the Danube River. The climate is mainly continental type. The floods are mainly of snowmelt-rainfall type having peak discharge usually more than 5-10 times the average one.

The HBV model is chosen for Yantra River modelling - cross-section Veliko Tarnovo (Cholakovtzi). The Norwegian DOS version of the model, developed in 1999 is used in this work. The HBV model can be classified as a semi-distributed conceptual model. The main input variables in the HBV model are temperature, precipitation and potential evapotranspiration.

The dynamics of the runoff for the Yantra river basin - cross-section Veliko Tarnovo (Cholkovtzi) is generally simulated quite well, with a slight tendency of underestimation of some flood peaks. The results indicate that the model performance is good enough for runoff forecasting.

287 - APPLICATION OF THE REGRESSION ANALYSIS IN THE WATER SUPPLY FORECAST

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The necessity of a forecast in the water resources state and water supply is due to the high rates of the economy developing and its requirements to the water resources. In the last decades the regression analysis methods obtained a wide-spread in the tendency extrapolation among the formal methods, applied to the random phenomenon forecasting. An example of the power regression using for water supply is represented. The test of the statistical significant of the proposed function and of the three steps forecasting is made.

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316 - MODELING SYNTHETIC DATA SERIES - MONTHLY PRECIPITATION USING PSEUDORANDOM SCALAR NUMBERS

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In this paper has been presented use of synthetic data series in hydrology. It is presented a novel (empirical-stochastic) approach to the modeling of synthetic series of monthly precipitation data has been developed. The model is using pseudorandom scalar values drawn from a uniform distribution, with some restrictions described in paper. Statistical parameters of data collected from precipitation station have been used as the model inputs (average, maximum and minimum monthly precipitation, trends...).During development of model data collected from several precipitation stations have been used in verification of the new model, comparing them with generated data using various hypothesis tests (Kolmogorov-Smirnov, Ansari-Bradley, Wilcoxon rank sum ...). In the end the results have shown that the proposed model may be considered acceptable.

One of input parameters in this model is the monthly precipitation trend, so it is possible to generate future synthetic data. These data are compared with various return period monthly precipitations, calculated with standard probability functions used in hydrology.

Keywords: synthetic data series, monthly precipitation rate, empirical-stochastic model, time series, registered data, generated data

377 - STRATEGIC ANALYSIS OF SURFACE WATER SALINITY USING A WATER QUALITY MODEL

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Most vital surface water bodies in developing countries are under serious threat of degradation resulting from constant discharge of polluted effluents stemming from industrial, agricultural, mining and domestic/sewage activities. The most affected river systems are those traversing cities and towns in urban areas. Alteration to the flow of Chenab river, mainly to serve the needs of irrigated agriculture as well as to fulfill the water shortage in eastern rivers of the country in post Indus Waters Treaty (IWT) scenario, has caused the water quality problem in downstream stretches especially in low flow months. The study is based on MIKE 11 HD and AD model results developed for a 292 km reach of Chenab River in Pakistan. The river model was developed for lean flow months of 2006-2007. The results of the model simulations have depicted the high salinity conditions in the downstream reaches where wastewater addition through surface drains is more as compared to the upstream reaches. Different scenarios were tested to predict the affect of varying the discharge of surface drains on the river water quality. The comparison of model runs for different months showed the critical month and the most affected river reaches due to addition of point source pollution.

Keywords: MIKE 11, River Chenab, Surface Water Salinity, Pollution,

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387- REEVALUATION OF THE HYDROLOGICAL CHARACTERISTICS DUE TO FLOOD COINCIDENCE AT THE CONFLUENCE

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At the junction of two rivers, one important problem is the to define the hydrological combinations which lead to a given probability of the discharge exceedance in order to design protection works, like dikes.

If the discharges of the two river basins A and B are correlated, the probability R of having at the confluence a discharge Q_A in the same time with the discharge Q_B is given by:

$$R = p(Q_A \mid Q_B) = p(Q_B \mid Q_A) = p(Q_A \cup Q_B) = p(Q_A) + p(Q_B) - p(Q_A \cap Q_B) \quad (1)$$

For a chosen value of R, there is not a unique solution (Q_A, Q_B), but a family of discharge pairs {(Q_{Ai}, Q_{Bi})} (Stănescu, 1972) leading to the same value of R. If Q_A and Q_B are correlated, the term $p(Q_A \cap Q_B)$ can be computed with the following relation:

$$p(Q_A \cap Q_B) = \int_{Q_A}^{\infty} \int_{Q_B}^{\infty} f_{xy}(x,y)\, dx, dy \quad (2)$$

A symmetric 2 D distribution is obtained after using the logarithms of the variables in the expression of the density $f_{xy}(x,y)$.

As an example, the following pairs of values of discharges on Danube River and Ialomita River were obtained for a probability of exceedance of 1%:

$p(Q_A)$	R = 1%		$p(Q_B)$
1.70%	600	4570	33.00%
2.50%	550	5000	17.72%
5.50%	**450**	**5500**	**7.26%**
19.90%	300	6000	2.62%
99.30%	50	6500	0.85%

One notice that a maximum discharge of 450 m³/s on Ialomita river (probability of exceedance of 5.5%), respectively a maximum discharge of 5500 m³/s on the Danube river (probability of exceedance of 7.26%), represents a combination leading to the flooding of the confluence areas with a probability of 1%.

Key words: bi-dimensional probability, flood coincidence, dikes.

TOPIC 8

INFORMATION SYSTEMS AND TECHNOLOGIES

004 - USE OF SATELLITE REMOTE SENSING TO DETECT CHANGE ALONG THE PALI CAPE - ERZENI RIVER MOUTH COASTAL SECTOR, ALBANIA

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Marine and continental processes converge along the coastline creating landscapes that are often involved in rapid change. Images acquired from space or from air are often used to monitor the coastline. Because of the advantages of repetitive data acquisition, its synoptic view, and digital format suitable for computer processing, remotely sensed data, such as Thematic Mapper (TM), SPOT, radar and AVHRR have become the major data sources for different change detection applications during the past decades (Lu et al., 2004). The albanian Adriatic coastline is distinguished for a strong dynamics, expressed on both the accumulation processes and advancement of the coastline in some sectors and in the strong erosion and sea advancement in several other sectors (Kabo, 1990). This study investigated using Landsat imagery of 1992 and 2002 the changes that have occurred during this ten-year period in the coastline sector Pali Cape - Erzeni river mouth. The study area is part of Lalzi Bay (in northwestern Albania) which is distinguished for an accumulative coastline, but in the last years has been involved in an erosive crisis.

The hills of Pali Cape consist of molasses formations where in the surface outcrop rocks of Messinian and Pliocene (Naço et al., 2003). Holocene deposits cover the other part of the study area. Two subscenes of Landsat TM and ETM+ were used for the change detection. To analyze the data was used the MAD algorithm (Multivariate Alteration Detection), (Nielsen et al., 1998), which is based on an orthogonal transformation of the difference image. Only the first three images of the difference containing the largest information for the land cover/land use changes were considered. Each of these images was threshold keeping only pixels which value was lower or higher than two standard deviations. The threshold images were after displayed in a color composite that was interpreted accompanied also by the visual analysis of the initial images. The results show the erosion of the Erzeni river delta (a surface of approximately 36 ha), the increase of earth surface in the south of Erzeni river mouth, increase of wetland surfaces in the area. It is indicated also an erosive situation in the sector of Lalzi Bay north of the Erzeni river and in the southwestern part of Pali Cape. Field photographs and interactive visualizations of the change in this sector accompany the study. The study demonstrates the applicability Landsat imagery to the monitoring of land cover changes along the coastline.

Keywords: Landsat images, Erzeni river mouth, change detection

014- NEW SOFTWARE FOR THE CALCULATION OF THE BACKWATER CURVES IN A BIDIOMENSIONAL FLOW: CASE OF A CHANNEL WITH HORIZONTAL SLOPE

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The backwater curves are the longitudinal profiles of the water surface in a river or in a channel where the water surface is raised or decreased by the presence of an artificial or natural obstruction. The calculation and the accurate construction of these curves can be made by several classical methods: successive approximations methods, direct integration methods and graphic integration methods, often heavy and complex.

The main objective of our study is to present a new software named Adimensional Variables Program destined to calculate the gradually varied flow, in a bidimensional flow: Case of a channel with horizontal slope; obviously, by eliminating as much as possible the diverse disadvantages which characterize the classical methods. It's the rapidity and the suppleness, which were aimed by this new software.

Therefore, the comparison of the results obtained by the suggested software with those obtained by the classical methods (Depth Variations Method, Backmettef's Method) permitted to confirm and to validate this new software on the gradually varied flow, in a bidimensional flow: Case of a channel with horizontal slope.

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027 - PREDICTION OF SATURATED HYDRAULIC CONDUCTIVITY USING SOME MOISTURE CONSTANTS AND SOIL PHYSICAL PROPERTIES

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Saturated hydraulic conductivity (Ks) is an important variable in all models that deal with the hydrological cycle. Determination of Ks in soils is a difficult and time consuming process. The objective of this study was to determine saturated hydraulic conductivity in soils by pedotransfer (PTF) models derived using some

moisture constants and soil physical properties. Saturated hydraulic conductivity values were determined in 30 different soil samples using constant head permeability method. According to path analyses results, direct effects of some soil properties on Ks in soils were in the following order; permanent wilting point (PWP) > bulk density (BD) > clay (C) > silt (Si) > field capacity (FC). Soil physical properties generally had the highest indirect effects on Ks through PWP. Saturated hydraulic conductivity predicted by the second order PTF models was highly significant using only C, Si and DB (r=0.868) and using only moisture constants, FC and PWP (r=0.796) in the models. Using moisture constants with the other soil physical properties in the second order PTF model increased significance level of the relations between predicted and measured values of Ks (r=0.955). Besides soil physical properties, having moisture constants in PTF models showed that saturated Ks values can be predicted more accurately in soils.

Keywords: Saturated hydraulic conductivity, pedotransfer model, soil physical properties, field capacity, wilting point.

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043 - THE VOCABULARY OF IRRIGATION: A TYPOLOGICAL APPROACH

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Words of different origin abound in contemporary English, including the vocabulary of irrigation. English has taken over a great number of words belonging to the field of irrigation from other languages, words which have nevertheless become somehow a permanent part of it. Most of them have been modified and brought into line with the phonological rules of English, helping native English-speaking people better understand and use them. Some others, though plain English words, are confusing even to specialists: they are terms belonging to different technical fields related more or less to the field of irrigation and gathered in encyclopaedias that abound on the Internet. We present some of the terms belonging to the field of irrigation pointing out the trends in this specialised vocabulary.

Keywords: irrigation, vocabulary, typological approach

054 - ASSESSMENT OF LAND USE AND LAND COVER CHANGES AROUND OHRID AND PRESPA LAKES USING LANDSAT IMAGERY

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In recent years a significant decline in the water level of the Ohrid and Prespa Lakes has been observed. The rate of decrease is even more apparent for Prespa Lake. Such a development among others threatens habitats of plant, bird and aquatic species, regional and global hydrological balance, and many other impacts that may have irreversible effects on the environment. At present the magnitude of change for the land-use and land-cover (LULC) around the lakes is relatively unknown.

The lakes and their watersheds are shared among countries that have very different socioeconomic and sociopolitical values. This adds to the complexity in determining LULC effect and potential for subsequent lake preservation. Establishing protocols for monitoring changes is important for understanding the LULC impacts and prescribing regulatory actions and decision policies. This study explores the LULC changes which occured between1988-2000 using Landsat Thematic Mapper (TM) and Landsat Enhanced Thematic Mapper (ETM) imagery. Monitoring changes from such protocols can serve as a broad communication, education and decision-making tool for collaborative decision processes that engage the countries sharing the lakes.

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058 - GLOBAL CHANGES OF THE EARTH RADIATION BALANCE - DATA FROM SATELLITE RESEARCH

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A number of global areas with low radiation are registered by using data from satellite observations, made on space systems. The analysis of the data shows

that the global power balance has considerably changed during the last two decades. At the same time, the reflected by the Earth short wave radiation has decreased. Many of the processes and interactions in the climatic system are non-linear; this means that there is not a simple proportional relation between cause and effect. The complex non-linear systems can act chaotic and the dynamics of these systems can be critically dependent on very small changes in the initial conditions.

On the basis of the received data, it is confirmed the statistics of the trend origin of the global distribution of the Earth radiation components is very important.

Keywords: radiation balance, satellite research

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059 - METHOD OF USING A SATELLITE AND GROUND INFORMATION WHEN RESEARCHING CATASTROPHES WITH AN ATMOSPHERIC ORIGIN

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A new method is discussed for research of thematic data bases from satellite and ground information which serve to solve problems about the research of the physical conditions of genesis and evolution of the atmospheric catastrophes. The basic experimental complexity of the created atmospheric situation, which forms a transition from a normal turbulent condition of the atmosphere to a state of exactly defined self-organized structure of the atmospheric catastrophe (the cyclone), is explained by the extremely quick (in space and time) transition into a dynamic regime of atmospheric convection.

The space distance methods focus on the genesis, transition of the clouds and the progress of the atmospheric catastrophes.

Keywords: satellite and ground information, atmospheric catastrophe

073 - WEB BASED SYSTEM FOR REMOTE READING OF WATER LEVEL

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The basis of the remote water level reading system is the subsystem for interoperability which enables a transparent access to the data from the various sources. The concept of interoperability, generally, refers to the ability of two systems to exchange messages. In the surface water quality monitoring process, this is a very important fact, regarding that the institutions monitoring water quality parameters have their information systems, and that the efficient qualitative decisions within one institution require insight into the data of other institutions.

Linking of remote measuring stations into a unitary system is realized through connecting computers adjoined to each measuring station into a virtual private network (VPN) using the service of package data transfer of the mobile phone network, GPRS. In the event of unforeseen circumstances, the system allows asynchronous and reading of the measured parameters from each individual measuring station, that is, response request for the desired measuring station. This makes possible to obtain measurements from the individual measuring stations which are particularly interesting at the concrete situation, regardless of the usual reading sequence and frequency.

The paper presents a system used for water level remote reading form the hydrologic measuring stations based on the usage of Internet technologies and Web which reduces the data transfer and access time, and reduces possibility of transfer and processing errors.

Keywords: Water Level, Web Based System, Remote Reading

074 - MOBILE COMMUNICATION SERVICES IN THE FUNCTION OF SURFACE WATER QUALITY PARAMETER MONITORING

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Increase of surface water pollution promoted the need for the simultaneous monitoring of water quality and flow rate measurement. Only the simultaneous measuring of water quality and hydrologic values (velocity, water level and flow rate) can allow a sensible assessment of the pollution transport. In order to have timely response to the occurrence of accident situations, it is necessary to provide an efficient monitoring. The paper presents the monitoring of the surface water quality, using mobile communication services (General Packet Radio Service (GPRS), Short Message Service (SMS), and Wireless Application Protocol (WAP)).

Using GPRS allows instantaneous connections, permanents access to the data, and a faster surface water quality data transfer. The proposed SMS subsystem makes possible the automatic sending of messages to the competent bodies and institutions responsible for responding to the abrupt changes of surface water quality parameters. WAP as a mobile communication service allows reviewing the data of a desired time period.

Keywords: Water Quality, General Packet Radio Service (GPRS), Short Message Service (SMS), Wireless Application Protocol (WAP)

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078 - WEB-BASED INFORMATION SYSTEM FOR MULTI-SCALE PHYSICAL STATE VARIABLES

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Projects in water related research and engineering are using mass of information originated from field measurements, numerical simulations and laboratory experiments on different time and space scale. The management and the

useful utilization of information require suitable information systems for efficient interdisciplinary and distributed project collaboration.

The conference contribution describes the concept, implementation and application of an innovative information system in a interdisciplinary research project to simulate the long-term deformation of large mountain sides. Models from hydrology, multi-phase groundwater flow and soil mechanics will be linked and integrated towards one interdisciplinary, multi-scale simulation system. Additional laboratory experiments are used for parameter identification and verification. The different models, field and laboratory measurements deal with physical state variables on different scales in time and space. The integration of the different models and collaboration between experts from different disciplines requires an innovative information system for multi-scale physical state variables.

The information system to be presented applies a generalized tensor-based modeling approach for physical state variables to overcome the different space and time scales of the interdisciplinary approach. Physical state variables as set of tensors include besides state data all analysis/simulation functional relationships and semantics from the research/engineering point of view. Examples are methods for up- and downscaling on different approximation levels. The application of object-oriented principles allows the setting up a powerful system-independent tool set for component-oriented hydroinformatics system development.

The tool set includes tools for user interfaces (editor, analysis and visualization), report generator (interactive HTML report) and information archiving, import/ export and management. The concept integrates the traditional separated pre- and post-processing, data bases and simulation processors in a holistic but flexible hydroinformatics system. The application of Web-technology and document/ information management enables a modern Web-based collaboration within the project. Details of the interdisciplinary project and of the information system for multi-scale physical state variables will be presented on the conference.

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084 - WETLAND AND AQUATIC SURFACE INVENTORY USING ALOS SATELLITE IMAGES EXAMPLES FROM THE SOLOGNE REGION (CENTRAL FRANCE) AND AL'TAMIN PROVINCE (IRAQ)

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Because of a detected increase in extreme hydrological events attributable to climatic change, over the last few decades aquatic surfaces and wetlands have become a major focus of concern to water resource scientists and to communities dependent on those water resources. Understanding river behaviour and monitoring aquatic surfaces through time is, for example, increasingly important for the purpose of planning the eventuality of floods and droughts. Decision making in such cases requires multi-scale and multi-date geographic coverage, and satellite images have become indispensable tool for this. New satellites with unprecedented detection capacities are constantly being launched. Their capacity to produce data of potential use to water resource management tasks needs to be tested accordingly in the hope that concerns of data resolution, accuracy and cost can be met with increasing efficiency as the technology progresses.

Among these more recent innovations, the ALOS Satellite was launched on January 2006 with data being available since 2007. This satellite is equipped with three sensors: visible and NIR (AVNIR-2: resolution 10 m); panchromatic (PRISM: resolution 2.5 m); and radar (PALSAR: resolution 10 m). This paper presents tests and processing results performed on visible and NIR images (AVNIR-2) to illustrate applications for water surface and wetland mapping in two very different regions renowned for their aquatic environments. The first region is the Sologne, which is a lake district in north-central France, and the second region is the Al'Tamin province (Tigris river catchments), in northern Iraq. A similar methodology was applied to both areas with adjustments based on structural, geomorphic and climatic parameters. This paper presents satellite image pre-processing and the results of unsupervised classification using both a fuzzy C means algorithm and radiometric statistical analyses. One main advantage of unsupervised, automated classification is that no a priori information is required. Map results are shown at a range of nested scales from 1:15,000 to 1:50,000. They illustrate how environmental knowledge and management prospects at local to regional scales can be improved with the use synoptic maps generated from AVNIR-2 data. Tests of AVNIR-2 classification accuracy and quality were carried out. Classification vectors derived from ortho-photographs (resolution 0.5 m) were used on small regions of interest to perform comparative evaluations. ASTER classification vectors were also used as a reference because of their lower resolution than AVNIR-2 images. Vectorial conversion of classifications show that only small errors are generated in the detection of wetland and water surface areas. For carrying out comprehensive inventories and synoptic maps of water resources over large areas, AVNIR-2 images seem to represent a good compromise in terms of resolution, file size, computational tractability, data availability, geographic coverage, ease of result interpretation and cost compared with other satellite image data commonly employed for the same applications.

Keywords: ALOS Images, AVNIR-2, Remote Sensing, Classification, Water Resources, Land Use

087 - INITIAL MEASUREMENTS OF PRESSURE IN WATER SUPPLY NETWORK OF PRILEP WITHIN FRAMES OF THE "WATER SUPPLY PROJECT"

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The Water and Sewerage Utility of the City of Prilep, Macedonia, has engaged the Consortium Kittelberger Consult GmbH - SETEC Engineering GmbH - ABC Consulting as Consultant of the Water Supply Prilep. The project is financed by the German Financial Cooperation through KfW. By a large extent the distribution network in the city of Prilep is comprised of old asbestos cement and PVC pipes. Measurements of pressure in the system were necessary to control the separation of the two pressure zones. City's water network consisted of two pressure zones - high and low zone. At several locations close to the borderline between pressure zones, pairs of Pressure Data Loggers were installed at the house connections (taps). After analysis of obtained data it was concluded that the zones are not physically separated. In order to establish proper separation between zones, as precondition for establishing District Metering Areas, a replacement of all boundary valves was proposed by the Consultant.

Keywords: pressure measurements, pressure zones, boundary, valves.

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090 - STATISTICAL CLASSIFICATIONS OF RIVER CHANNEL DEFORMATIONS

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There are several classifications of alluvial channel patterns and they are typically based on the assumption that the transitions between the different channel types are threshold-governed processes. Although alluvial channel patterns form a continuum rather than discrete types, threshold-based approach implies distinction between a finite number of morphologic classes with somewhat fuzzy boundaries. Russian fluvial geomorphology traditionally employs classifications that operate with relatively large number of channel types. A typical example is

given by the classification developed at the Russian State Hydrological Institute that has 7 classes For modelling purposes, however, more appropriate would be to use generalized classifications with only few types of river channels, so the most of such models use either the combination of discharge and slope of the river or valley (QS-type models) and distinguish between the two major channel classes, meandering (single-thread) and braided (multi-thread). Hierarchy of such classifications have been fulfilled.

The majority, if not all of the QS-type fluvial models define the number and position of divides between channel classes in such a way that they "visually" split the QS space on the empirical graphs into several zones, each populated predominantly with the points corresponding to one and the same river channel type. An alternative approach that we used in our study is to optimize the divide between points of two different classes and to evaluate the efficiency of such a classification using statistical criteria. Each of the divide lines between the neighboring classes is represented as a linear function in a logarithmic QS-space. Coefficients b1 and b0 are defined in such a way that the function E reaches its minimum, where E is a metric that characterizes the intrusion of non-native points to the given class, and penetration of the native points into the neighboring class. Geometrically E is a sum of triangle areas and the method represented by may be considered as an analog of the Least Square Method (LSM) and called the Least Triangle Areas Method (LTAM). Using the LTAM, new divide lines have been obtained for classifications of Romashin and Van den Berg. In Romashin's classification it has been obtained that the divided line between braided and meandering classes more significance that between two classes of meandering patterns. For assessment of efficiency of any classification two main features are used: a penetration of the native points (class 0) to other class (class 1) and an intrusion of non-native points from class 1 to class 0. The following parameters are suggested to characterize these two features: number of native points of 0th class and their variance and range in class 1 (fuzzy of native class); number of points of 1th class and their variance and range in class 0 (intrusion to native class). Basic ratios of efficiency are suggested: statistics of Fisher criteria; relative ratio (in %) number of points, their variances and amplitudes. These parameters of efficiency have been used for assessment of Romashin's and Van den Berg's classifications.

Keywords: classification, river channels, Romashin and Van den Berg method.

092 - INFORMATION-COMPUTER SYSTEM FOR HYDROLOGICAL COMPUTATIONS

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Regional decision support and management system are developing for a practical realization of hydrological computations for water projects in any region. This system is realizing as the specialized GIS for regional hydrological computations and includes data base, software for hydrological computations in gauged and ungauged sites, visualization of results on digital maps. Development of GIS includes two main stages: creation and operation. During the stage of creation the following tasks are fulfilled: creation of data base and software for data base, restoration of long-term time series, assessment of homogeneity and stationarity, determination of design hydrological performances in gauged sites, development of regional models for computation in ungauged sites, software for hydrological computations and representation of the results for gauged sites.

During a stage of operation of this GIS two main functions of the system take place: monitoring of stability of all characteristics (and their re-computation if it is necessary) in sites of observations and computations for ungauged sites.

For regional computation, a user forms his own database. This database includes field measurements fulfilled by the user at ungauged site during any period of time and basin descriptors obtained by user for ungauged site which are factors of regional models (for example, basin area, precipitation, average altitude of basin, etc). In addition, the user forms his own database of historical records at analogues sites for restoration of historical long-term series from short-term field observations by space-time regional relationships. For computations the user applies this database as well as a database of knowledge, i.e. all results obtained on the previous stage of GIS formation: computed hydrological characteristics at sites and parameters of regional models. The results of computation for any ungauged site can be presented and restored in the database as new information.

Keywords: decision support system, hydrological computations, data base, software, GIS.

106 - TORRENŤ CLASSIFICATION - BASE OF RATIONAL INTEGRATED WATER RESOURES MANAGEMENT

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In nature, there are a great number of torrents. The most widespread are the small torrents called gullies. Their lengths are several hundreds of meters and watershed areas are of proportional sizes. Their characteristic is that water and sediment flow in their channels only during and immediately after a heavy rain. On the other end of that huge specter of torrents are the large torrential rivers, whose lengths and watershed areas amount to several hundreds and thousands of kilometers. The prefix torrent is derived from the characteristics of flood waves which occur very quickly, carry significant amounts of sediment, but instead of flooding, they destroy whatever is in their way.

The methods of classical hydrography do not enable a sufficiently precise torrent classification, because the majority of torrents do not satisfy the main condition of watercourse classification, i.e. running water during the predominant part of the year.

During the twentieth century, Serbia was impacted by a great number of torrents of all magnitudes. They destroyed the roads and interrupted the railway and road transport. They also damaged the settlements, people, cattle and other movable and immovable property. The State was faced with a great problem, because it did not have even an approximate knowledge of the number of torrents and could not plan the works for the regulation of torrents and the defense against torrential floods and Water Management.

A complex methodology for torrents and erosion and the associated calculations was developed during the second half of the twentieth century in Serbia. It was the "Erosion Potential Method". One of the modules of that complex method was focused on torrent classification. The module enables the identification of hydrographic, climate and erosion characteristics. The method makes it possible for each torrent, regardless of its magnitude, to be simply and recognizably described by the "Formula of torrentiality".

The above torrent classification is the base on which a set of optimisation calculations is developed for the required scope of erosion-control works and measures, the application of which enables the Integrated Water Resources Management of significantly larger torrential regions compared to the previous period. This paper will present the method of torrent classification and obtained results.

Keywords: soil erosion; torrents; torrent classification; Integrated Water Resources Management

121 - GIS FLOODING MAPS OF KOSOVO - METHOD OF RIVER LEVEL

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GIS applying in Kosovo has started very lately. For the first time it has been used in 1999. Kosovo institutions still do not have GIS based on high standards that will allow them to get very useful results by using it. In this paper is going to be presented on of the methods of creating flooding maps based on DEM (Digital Elevation Model) and some observing points of river level. This method will help hydrometeorology, agricultural, urban institutions that in a fast and accurate way to make flooding maps based on level of river. If observing points are digital and with possibility of data transfer in distances then monitoring of flooding area and dynamic of its spreading will be faster and accurate.

Keywords: Flooding maps, River, DEM, Observing points, GIS

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122 - THE USE OF GIS TO CREATE MAP OF GROUNDWATER IN SOME SAMPLES IN KOSOVO

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Map of groundwater for most of places in Kosovo is very problematic. Because the building of living houses in Kosovo places it has been pending from water, especially by groundwater, creation of these maps in level of place will be big a big success for local inhabitants.

In this paper is going to be presented method of creation of these maps by GIS based on DEM (Digital Elevation Model) and level of water in actual wells in one place. When we have all these data, then by method of interpolation it will be

created map of groundwater which will help that new drilling will be more accurate and successful on water finding.

Keywords: Groundwater, Wells, GIS, Drilling, DEM

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130 - DEVELOPING OF COMPUTER BASED INFORMATION SYSTEM FOR ASSESSING APPLICABILITY OF IRRIGATION WATER DEPENDING OF ITS QUALITY

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The development of a computer based information system, i.e. decision support system for assessing the suitability of the water for irrigation aims to protect cultivated crops not to be irrigated with water of unsuitable quality. The system uses laboratory analysis information, cultivated crops data, soil and agro-climatic characteristics of the region, irrigation technology, legal rules in force and some additional parameters.

The previous part of the work, as a separate paper, focuses on the methodology for decision-making for applicability of irrigation water at various crops on the basis of the assessing its quality.

The programme structure of the presented system, which is the topic of this paper, contains the detailed description of the three main programme modules: input data uploading and updating; assessment of the irrigation water quality; preparation of recommendations. The estimation algorithm, based on the methodology, includes three fundamental steps: establishing of an irrigation water quality indicators database, assessment of the irrigation water quality and issuing recommendations for irrigation water utilization.

The results are presented in groups: potential irrigation problems, specific toxicity, miscellaneous effects, choice of recommendation related to the obtained indicators.

Keywords: Water Quality Assessment, Irrigation, Decision Support System, Algorithm, Computer Programme

133 - REMOTE SENSING IN HYDROLOGY: EXAMPLES IN BULGARIA

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The products from the Earth Observation Technologies are used in many areas concerning the management of our environment. Hydrology is one of these fields. In general the applications of remote sensing in hydrology could be summarized in wetlands mapping and monitoring, soil moisture estimation, snow and ice monitoring and estimation, flood mapping and monitoring, river/delta change detection, drainage basin mapping and watershed modelling, irrigation channels' leakage detection etc.

The satellite images are a valuable source for extracting information for the land cover and land use. They represent an independent source of information, which could be updated regularly, based on the temporal resolution of the satellites. On the other hand the different spatial resolution of the satellites gives possibility to map hydrological objects in various scales - today we could go to around 1:5000. The spectral resolution of the satellites allows the hydrologists not only to map the wetlands, but also to derive information for various characteristics of the water: pigments, suspended solids, salinity etc.

The products derived from the processing of the satellite images being spatial information could feed different hydrologic and hydraulic models. On the other hand archived satellite images could serve as a reference data for verification of the model parameters based on real scenarios.

Last but not least the use of geostationary satellites and satellites with higher revisit time provide the data necessary for monitoring natural disasters - such as floods. The increasing number of high and very high spatial resolution satellites gives the possibility to deliver detailed information for the crisis area several hours after the event occur. This information is used for preparation of fast track maps in order to support crisis management.

In this paper, examples from the experience of Remote Sensing Application Center (ReSAC) - Bulgaria will be discussed. Two cases are related to the fast track mapping with SPOT and IRS for floods, which have occurred in June and August 2005. Another hazard mapping example, which will be shown here, is related to the flood associated with April 2006, which was prepared on the basis of SPOT and FORMOSAT-2 scene interpretation. Further, a project initiated in 2007 for collecting and preparing basic data for building a strategy for Iskar river embankment, in the area of the town Novi Iskar in Sofia region will be also

discussed. Moreover, an example, which was prepared for the International Charter -Space and Major Disasters- for the application of FORMOSAT-2 imagery, related to oil spill detection along Danube River in 2006 will be also revealed.

Keywords: Remote Sensing, Floods, Fast Track Mapping.

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147 - INTEGRATED WARNING SERVICE SYSTEM OF CZECH HYDROMETEOROLOGICAL INSTITUTE (IWSS - CHMI)

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CHMI's warning service is a component of Integrated Rescue System of Czech Republic which supplies issuing of warning information for the territory of Czech Republic from both meteorological's and hydrological's risks point of view. Its main purpose is to inform and warn authorities, media, people and users of hydrometeorological data about probability of dangerous weather and to save human lives and property.

This service is carrying out by meteorological and hydrological forecasting sections (Central and Regional Offices) of CHMI in co-operation with Military Weather Service of Czech Republic using concept of Integrated Warning Service System (IWSS). It was established in February 2000 and adapted in 2006. The basic item of IWSS is a senior forecaster on Central Forecasting Office. He is responsible for assembling and timely issuing of this information.

Warning information of IWSS is issued for 26 dangerous hydrometeorological phenomena divided into 7 categories: I. Temperature and humidity conditions, II. Wind, III. Snowfalls and snow phenomena linked with increased of wind speed, IV. Freezing phenomena, V. Thunderstorms with accompanying phenomena, VI. Rainfall and VII. Flood phenomena. Depending on a degree of intensity of each dangerous phenomenon is assign one of three levels of danger. Levels of danger are made in agreement with international project of visualization danger weather on web pages (EMMA project).

Basic component of IWSS is warning information. Forecasting warning information (FWI) is issued if any of dangerous weather phenomenon of IWSS is forecasted or it has just occurred and it is supposed its further duration. Usually recommendation for people is given into FWI. Second type of warning information is information

about occurrence of extreme events, which is issued in case of occurrence (measured, observed or objective detection) of danger event with extreme level of risk and rapid progression, e.g. snow storm, severe thunderstorms with very dangerous accompanying phenomena (flash floods, hail), extreme precipitation or in case of floods if reached the third flood stage. Information is issued to notice an occurrence of extreme dangerous event or to describe its development up to three hours ahead.

Outputs from IWSS are available in ASCI and XML format immediately after their issuing. Special text information is sending to Integrated Rescue Service, Military Weather Service, local authorities, catchment organizations, media - Warning is given to Web site of CHMI in graphical and tabular format. Notifying message for neighboring national meteorological services (Austria, Germany, Poland, and Slovakia) is prepared and distributed automatically by e-mail when warning information is issued. SMS information is also prepared for some users. CHMI has become a new participant in EMMA project (Meteoalarm). It is also important to educate authorities, media and other users for better understanding of these and information of this problem.

Keywords: Integrated Warning Service System (IWSS), Warning information, Outputs from IWSS

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154 - DEVELOPMENT OF CADASTRE OF TRAINED AND NON-TRAINED RIVERSIDES OF THE SAVA AND DANUBE RIVERS ON THE ADMINISTRATIVE TERRITORY OF THE CITY OF BELGRADE

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Considering very complex water resources issues and the specifics of the city of Belgrade, which, as such, requires an integral, unified and complex treatment, it is necessary to establish a water resource information system on the administrative territory of the city of Belgrade, as of an important part of future unified information system of Serbia.

Regarding an exceptional importance of the riversides and surrounding areas of the Sava and Danube rivers for the development of the city of Belgrade, which

is the most important segment within the information subsystem "monitoring and evaluation of resources", functional modules are being established - "Cadastre of trained and non-trained riversides of the Sava and Danube rivers" and the Cadastre of water land of the Sava and Danube rivers.

As the - "Cadastre of trained and non-trained riversides of the and Danube river" and the - "Cadastre of water land of the Danube river" (phase I) were produced in 1997/1998 in a classic way (in paper documents), the matter has been re-actualized: it now has to be transformed into an electronic format. Along with it, the software package for cadastre operation is of ultimate importance.

Namely, all these modules would enable to fully analyze the problems of riversides and water land of the Sava and Danube rivers, and water resources problems in general, in the entire administrative territory of the city of Belgrade. A consideration of the problems and conflicts which are manifest on the riversides would enable a more efficient solution of other problems, primarily of interaction of waters with other natural resources, but also of a number of other problems.

Further, in order to fully and comprehensively provide the data and information reflecting the status of water and other relevant resources of the observed area, and which are necessary for the water resource management of strategic development and for improvement of water regime, it is necessary to establish other functional modules of water resource information system and connect all the functional modules into a unified water resources information system on the territory of the city of Belgrade, which would create the conditions for implementation of the proclaimed approach to integral management of water resources on the basis of sustainable development principles in the framework of the highest goal, integral space management.

This paper presents the developed functional modules "Cadastre of trained and non-trained riversides of the Sava and Danube rivers" and the "Cadastre of water land of the Sava and Danube rivers" as well as the software package for their operation.

Keywords: Integral management, cadastre, water land, Belgrade

155 - POTENTIAL FOR USING NEW AND RENEWABLE ENERGY SOURCES IN THE CONTEX OF SUSTAINABLE DEVELOPMENT

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The «Earth Summit» in Rio de Janeiro (UN Conference, 1992) represented a turning point in the global approach to the environment protection, where a sustainable development concept was accepted as a general development strategy. For the time being, the most topical global task is defined in the United Nations Framework Convention on the climate change (1992) and the Kyoto Protocol (1997).

Scenario of an integral sustainable development represents the link between the politics of economic growth of societies and environmental development. Environmental sustainability comprises rational usage of natural resources, and especially of non-renewable and partially renewable resources (mineral and energy resources, water, land), better usage of resources and energy, reduction of emission of all kinds of waste matter. As the entire development strategy of a country considers the energy reserves and potential, a full integration of the environmental requirements in energy usage is a priority of sustainable development concept.

In this context, the EU, in the White book on the renewable energies (1997) set the goals of non-renewable natural resources control, and increase of production from the renewable sources. Directive of EU no 77 (2201) promotes the increase of production of electric energy from the renewable sources in the internal energy market.

New and renewable energy sources represent for many countries a significant potential due to the favorable local conditions to use them. Redirection to usage of available renewable energy sources is especially important for developing countries, which seem to acknowledge, as a priority of their development, a selective usage of new and renewable energy sources, with an aim of slowing down the import of energy, and reduction of the negative influence on the environment and organizing the additional activities for local industry and creation of jobs for local population, but also the process of adapting to practice and regulations of EU in this area.

This paper presents the development of usage of renewable energy sources in Serbia and Bosnia and Herzegovina and potential for their usage. Special attention has been paid to the usage of hydro power potential of river courses,

wind energy and of energy and resources potential of waste waters in the treatment facilities. The paper emphasizes the importance and significance of new and renewable energy sources, but also the topical problems and the obstacles for their comprehensive usage and development in this area, with an accent on the existing infrastructure in the area of renewable energy sources usage. Special emphasis is on the identification of the barriers, as well as on the concrete propositions for appropriate measures and activities in order to create conditions for an increased usage of renewable energy sources, and attainment of European standards in this area.

Keywords: renewable energy sources, hydro power potential, sustainable development, environment protection.

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168 - NEW TRENDS IN "WATER QUALITY DATA-INFORMATION" TRANSFORMATION PROCESS

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Ascertaining quality of water, which is defined in terms of its physical, chemical and biological parameters is very crucial before use for various purposes. Water quality assessment aims determining legal compliance of the quality with the objectives, describe water quality at regional, national or international scales, and examine spatial temporal changes (trend) etc. The method mostly being used in the world is interpreting water quality based on the comparison of experimentally determined parameter values with the existing guidelines. This provides proper identification of contamination sources, and may be essential for checking legal compliance. However, it does not provide information on spatial and temporal changes; environmental effects dominantly govern water quality etc. Water quality index-WQI and environmetric methods have started being used in last decades as effective tools to extract information from complex data sets. WQI improves understanding of water quality issues by integrating complex data and generating a score that describes water quality status. Environmetric methods comprising mainly multivariate statistical techniques are used for better defining the sources and typology of the pollution. In the presented study "British Columbia and US National Sanitation Foundation, NSF" water quality indices haven been used to

assess water quality data obtained from 17 sampling sites and analysed for 9 variables in Buyuk Menderes Basin, Turkey. Application of two methods to the same data sets provided interpretation of water quality based on two different approaches. Then, temporal changes were determined using Seasonal Kendall analysis. Finally, applicability of these methods, advantages and disadvantages in the case of Buyuk Menderes was discussed.

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169 - MOBILE SERVER FOR GLOBAL MONITORING - LAST TWO YEARS DEVELOPING AND ACTIVE WORK

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Two years after the last presentation of this idea (Balwois 2006, but also on Balwois 2004), there are lots of new features that extend the power of managing a whole process of monitoring and informing. The server in the last two years kept together data distribution and in a point measured data about meteorology, hydrology, astronomy, seismology and ecology. On everyday basis more than 1400 files (pictures, grids, texts and multimedia files) are archived. More than 600 today-files and nearly 1000 last-5-days files are temporary. Multi scale of monitored areas and multi purpose of estimated distributions still remain very important. More than 4 languages are used to build information close to the needs of the potential users. And after all, collaboration is possible on different basis.

In the last two years a program of reporting activities on multilingual blogs is created. Main applications charged to control the work of a whole process is significantly improved.

In this moment the recent work is focused on adding own web-server and own CMS system and WAP format oriented messaging. These few new branches will improve the whole idea of global monitoring and informing.

All applications part (more than 95%) can work from read-only partition. The period of complete rewrite of the rest of the applications is in the nearest future. Running from virtual read-only partition will approve the mobility of the server. Should be noted that large number of commercial and freeware application must be already installed on the server (or servers) to provide the whole process. The further development of this information system will be extended in two different ways:

- 3D animated content of observed and calculated situations.
- Laptop installation (enable to perform the biggest part of daily tasks) with CMS close to administrator,
- Build a community involved in the process,
- Monthly thematic multimedia CD.

Keywords: Information system, management, environment, meteorology, hydrology, programming, 3D graphics, animations

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170 - USING COMPUTER-BASED SIMULATION MODEL TO ATTAIN BETTER CANAL OPERATION AND MANAGEMENT

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The conveyance and distribution networks of the many irrigation projects consist of open canals under manual control. The hydraulic behavior of the open canals networks is not always easy to foresee, especially in case of changing outflow discharge for a short period in several demand points. The daily operational management is a task of great difficulty. Main obstacle the user to receive irrigation water on schedule is the long period of time needed for increased water discharge arrival.

In this paper computer-based hydraulic simulation model is used to test an operational procedure aimed at improving canal capabilities to better satisfy the water user needs through decreasing the time lag in water deliveries. Flow simulations were performed with consideration of hydraulic conditions along the entire canal solving numerically the complete Saint Venan equations and appropriate canal control parameters were established. The efficiency of the proposed operational procedure was assessed through the estimation some performance indicators at canal off takes.

Keywords: irrigation canal, hydraulics, water delivery, management

199 - GIS TECHNOLOGY IN WATERSHED ANALYSIS

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Watershed is an area, which catches the water from precipitation and then is drained by a river and its tributaries. Recently it has been identified that unless the watersheds are not managed in an integrated sustainable manner, then not only the water resources but also other resources such as vegetation, fertile soil, fauna and flora get depleted. Rational management of upper and lower parts of a watershed is equally important for the sustenance of the environment. Therefore it is extremely important to use an integrated spatial approach for managing watersheds and river basins. The GIS technologies nowadays occupy a prominent place among the modern computer tools and constitute an invaluable support in the decision making of problems with a spatial dimension. GIS offers integration of spatial and nonspatial data to understand and analyze the watershed processes and helps in drawing a plan for integrated watershed development and management.

In this work briefly the essential characteristics of a GIS is exposed and its potential of application in the scope of river basin management is examined. A simple case of application in a river basin of Bulgaria is presented. The possibilities to study and analyze the hydrological regime and water resources in Bulgaria by means of GIS technologies are examined. It is shown the effectiveness of the application of geo-information technologies for determination of hydrographic characteristics and analysis of hydrological processes.

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210 - METEOROLOGICAL RADAR RAIN INTENSITY ESTIMATION

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Today meteorological radars are basic systems for atmospheric study. They give information for atmospheric condition, particularly for space and time distribution, characteristics and phenomenon connected with of cloudiness.

Basic radar advantages as instrument for surveillance and measurements from distance has to obtain information in real time (frequency up to 5 min.) and large observation space (radius up to 120 km).

This kind of information has special importance for managing of dam and Hydro power plants in two ways. On one side is electricity production and on other side are security measures against flood and water supply management.

In structure of National Hidrometeorological service of Macedonia are two automated meteorological radar systems with range of observation which covers all territory of Macedonia. Primary goal of these radar systems is conducted hail suppression operation on territory of Macedonia.

In 2005 radar systems were upgrade with software, ASU - MRL, for automatization of hail suppressions activity. But this software, among other things, has possibility for rain intensity and rainfall estimation in real time on territory up to 150 km. Estimation is made on basis of relation between rain intensity - R (mm/h) and radar reflectivity - Z (mm^6m^{-3}).

Radar data are transferred from radar centers to forecast department in the Centre of NMH Service with wireless internet traffic with 1 Mbps speed. Here they are used for forecasting, now casting and early warning of hazard meteorological phenomena needs and also for the necessities of hydrology and flood warning.

Keywords: radar, rain intensity, estimation

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223 - THE ROLE OF SATELLITE IMAGES FOR SUSTAINABLE DEVELOPMENT OF THE WATER RESOURCES IN THE MOUNTAINOUS TERRAIN

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As the resources are decreasing on the Earth, the importance of using and saving the existing land and water resources wisely such that the limited quantity of water will be available for a longer period with the desired quality become more important in the framework of sustainable development. Snow is one of the main water resources, therefore monitoring and estimating the snow water equivalent play important role in predicting discharges during melting seasons. Turkey is a mountainous country and many basins in the country are largely

fed from snow precipitation whereby nearly two-thirds occur in winter and may remain in the form of snow for half of the year. The concentration of discharge mainly from snowmelt during spring and early summer months causes not only extensive flooding, inundating large areas, but also the loss of much needed water required for irrigation and power generation purposes during the summer season. Accordingly, modeling of snow-covered area in the mountainous regions of Eastern Turkey, as being one of the major headwaters of Euphrates-Tigris basin, has significant importance in order to forecast snowmelt discharge especially for optimum use of water in energy production, flood control, irrigation and reservoir operation optimization.

Distributed snow models may require the following spatially distributed parameters: snow-covered area, grain size, albedo, snow water equivalent, snow temperature profile and meteorological parameters, including solar radiation. In mid-latitudes, snow can be seen continuously in the mountainous terrains. The difficulty in accessibility to perform the measurements at the remote site makes the use of satellite images and/or aerial photographs in monitoring and estimating the snow parameters more valuable. The paper presents here the critical issues for the comparison of the products that optical remote sensing can deliver with snow course measurements and automated weather operating stations (AWOS). The use of MODIS snow products in snowmelt modeling will be discussed and the early findings of Satellite Application Facilities on Hydrology (H-SAF) project, which is financially supported by EUMETSAT, will be presented.

Turkey is a part of the H-SAF project, both in product generation (eg. snow recognition, fractional snow cover and snow water equivalent) for mountainous regions for whole Europe, cal/val of satellite-derived snow products with ground observations and cal/val studies with hydrological modelling in the mountainous terrain of Europe.

Keywords: snow, monitoring, satellite images, HSAF

236 - THE ECODONET PROJECT: A VIRTUAL ECOSYSTEMS DATABASE OBSERVATORY NETWORK FOR PUBLIC AWARENESS AND SUSTAINABLE DEVELOPMENT

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This paper introduces the ECODONET project that aims at the improvement of the management, protection and sustainability of Acherontas, Kalamas and Torre Guaceto ecosystems. The objective will be first accomplished via satellite and investigative identification of the current ecosystems quality. Furthermore, a mobile Web based virtual observatory with simplified scientific ecosystem information will be developed. This hands-on mobile exhibit will be model used to motivate and train specific groups of local population in the region of Acherontas-Kalamas ecosystems. The expected output will be the establishment of a regional electronic network of volunteers and stakeholders and the foundation of a Community Based Ecosystem Monitoring Network (CBEM). The EcoDO system audience will eventually be expanded with the installation of permanent electronic environmental information kiosks.

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248 - MERGING MSG INFRARED IMAGES AND RAIN GAUGES DATA TO ESTIMATE RAINFALL FIELD ON SMALL CATCHMENTS FOR HYDROLOGICAL APPLICATIONS: A CASE STUDY OF VIBO VALENTIA, ITALY

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In the Mediterranean area, flash-floods in small catchments are mainly due to deep convective rainfalls which show both spatial and temporal large variability.

For this reason the reconstruction of the ground rainfall field is difficult, and the use of rain gauges can result poor to depict convective events from a hydrological point of view.

Thanks to its spatial and temporal resolution, the geostationary satellite MSG-2 is a very important tool for monitoring the dynamical evolution of cloud structures above European area. In particular, in the infrared window, the brightness temperature TB of convective cloud top is related with ground rainfall hg. By using rain gauges network to calibrate the TB-hg relation, it is thus possible to get the ground rainfall field at the same spatial resolution of the satellite image (~3 km at nadir for Italian regions). Working with small basins, after a precise satellite pixel projection, parallax correction of satellite data is required to avoid distortion induced by clouds height.

In this work we analyse a very deep convective event which hits Vibo Valentia town on July 3rd 2006, using synoptic, satellite and raingauges data.

Keywords: extreme precipitations, hydrology, floods, satellite imagery, METEOSAT, satellite rainfall estimation.

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249 - THE APPLICATION OF THE VISIBILITY ANALYSIS FOR FIRE OBSERVATION TOWERS IN THE GELIBOLU PENINSULA (NW TURKEY) USING GIS

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Forests constitute one of the most important natural sources and aspects of the Earth's biosphere owing to their multifunction characteristic. They are of prime importance in many ways, such as water balance, soil conservation, prevention of environmental pollution and sustaining biodiversity. However, they are heavily exposed to destruction by human interference to obtain new agricultural areas, fuel resources, building materials, and grasslands etc. In addition, fires caused by natural or human factors also give rise to deforestration at considerable rate.

This paper focuses on forest lands affected by fires extensively in the Gelibolu Peninsula, which is situated in the western part of the Strait of Çanakkale (Dardanelles,) NW Turkey. The peninsula has a total area of approximately 1073 km² and is one of the most vulnerable sites exposed to fire-induced deforestation

in Turkey. Forest fires occur mainly during dry and hot summers as the peninsula is located in the Mediterranean Climatic Zone creating vulnerable conditions for fire occurrence. Two great forest fires occurred in the Gelibolu Peninsula in the years 1986 and 1994. These fires caused forest destruction of totally 10.049 ha. The fact that southwest of Gelibolu Peninsula is an historic-national park increases the significance of forest fires.

In this study, the visibility analysis of fire towers was used for observation of forests in the Gelibolu Peninsula. The special emphasize was given to map visible and invisible areas using Geographic Information Systems (GIS). In addition, alternative fire tower sites are proposed for observation of invisible areas using GIS again.

Keywords: Forest fire, Observation towers, visibility analaysis, GIS, Gelibolu Peninsula, Turkey.

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250 - INVESTIGATION OF HUMAN INDUCED COASTAL DEGRADATION ON THE KEPEZ DELTA (NW TURKEY) USING AERIAL PHOTO INTERPRETATION, REMOTE SENSING AND FIELD DATA

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Turkey's coastal areas face currently severe environmental degradation as a consequence of increase in residential, industrial, tourism and recreational activities since early 1970's. Owing to inadequite management along the coastal plains, various environmental deterioration threats caused by human interference emerged. In this research, an example of degraded deltaic environments is presented from the eastern side of the Strait of Çanakkale (Dardanelles) in the northwestern part of Turkey. Based on aerial photo interpretations combined with satellite image processing (ASTER) and current GPS measurements, we focused mainly on two main topics in the area studied: coastline change and land use/ land cover variations detection.

According to data for the period between 1962 and 2005, seaward progradation of maximum 40 m and landward retreat of 20 m were determined along various parts of the coastline. Littoral transport of coast material was affacted by the construction of the Kepez Harbour occupying 4.8 ha land with shoreline advance

of 91.4 m. From 1935 to 2000, Kepez town which is settled on eastern edge of the delta plain showed a considerable growth of 24 times on fertile agricultural fields associated with the population pressure since the beginning of 1970's. Since 1980, a wide range of land was covered by construction of summer houses, which resulted in both loss of farming lands and deterioration of beach characteristics. Today, 102.3 ha land occupying approximately 16 % of the delta is occupied by residential areas and summer houses. Beach and coastal sand dunes forming only 3.9% (24.6 ha) of the delta is also severely threatened by land based pollution (dumping of wastes) and illegal use of beach materials for sportive, social and building purposes. The excessive presence of pollution-tolerant algae species, such as Ulva sp, Enteromorpha sp., Cladophora sp. Cystoseira barbata, Halopteris sp. Colpomenia sp., Callithamnion sp., Polysiphonia variegata, Nemalione sp. Lomentaria sp. refers to poor water quality along the shoreline. Conversely, coastal dune vegetation characterized by Phragmites australis, Hordeum marinum, Phleum cristatum, Ammophyla littoralis, Bromus rigidus, Glaucium flavum, Hypecoum pendulum, Convolvulus soldanella, Otanthus maritimus, Senecio vernalis, Eryngium maritimum, Medicago marina, Juncus sp. Salsola etc, decreased at significant rate.

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252 - TEMPORAL WATER LEVEL CHANGE DETECTION IN THE MANYAS LAKE (NW TURKEY) USING GIS, REMOTE SENSING AND METEOROLOGICAL DATA

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The aim of this study is to determine the temporal change of water level of Manyas Lake which is situated in the northwest of Turkey. Average water level of Manyas Lake is 14 meters, its water surface area is 15.500 ha. Lake and near vicinity is the National Park (24.047 ha.) which is on bird migration routes between Asia, Europe and Africa.

Wetland has very important ecosystem, constituting from willow and ash trees, wetlands and marshes. It has vital importance for 266 bird, 118 plant, and 23 fish species in the lake. Because of natural and human factors, the water level of the lake changed seasonally in the past 20 years. Because of the drought in last two years (2006 and 2007), the water level of lake decreased tremendously from 17 meters to 14 meters. The decrease of water level affects fisheries, wildlife habitat,

and irrigation water supplies, as well as farming productivity and self-sufficiency. It also, affects the lake ecosystem negatively and causes degradation of the wetland and breeding areas of the birds. The people live in the villages around the lake dealing with fishery and agriculture depending on the lake. The Manyas Dam which was built in 2006 and planned to hold water very soon, will help to control of the water level in the lake.

In order to determine the changes in Lake's ecosystem and water level long rainfall and temperature data obtained from Turkish State Metrological Service and State Hydraulic Works were analyzed. The water level difference according to years was found. 1:25000 scaled topography maps were scanned and transformed into computer and coordinated (European Datum 1950-UTM Zone 35N). Landsat ETM+ 2006 satellite image taken from multispectral sensors were used. ArcGIS Desktop v.9x was used to analyze the data.

Based on this investigation, the area of the lake has been decreased approximately 15.000 square kilometers from August 2002 to October 2007. The changes in the lake area have resulted from low rainfall and high summer temperatures.

Keywords: Manyas Lake, water management, drought, environmental problems, wetland.

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262 - USE OF SATELLITE REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEMS TO MONITOR LAND DEGRADATION ALONG ONDO COASTAL ZONE (NIGERIA)

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Land degradation can be described as a process of reduction in resource potential of land which thereby reduces the capacity of land for its normal life support functions and services. Abdukadir (1993) referred it to the processes such as erosion hazard, flood hazard, drought, salinization, reservoir sedimentation, toxicity hazards, moisture stress and pollution that may act to force the conditions of a land to become unpleasant or less useful to man. The task of managing the resources of the earth especially coastal land is growing in complexities daily. This is due partly to increasing uncertainties in the natural-physical systems as well as increasing interference of man with these natural systems. To fully manage this environmental challenge of land degradation especially in the coast therefore

requires an understanding of a full range of earth science disciplines and a technique that can possibly allow for acquisition and integration of wealth of data on the environment and its past and present attributes. This is necessary for pro-active decision making to forestall land and environmental degradation resulting from unsustainable land use practices. The technique and application field that allows data and information on all components of the environment to be acquired, stored and manipulated to manage natural and human activities resulting in land degradation is called Remote Sensing and Geographic Information Systems. This is corroborated by Eedy (1995) and World Bank (1993) that Remote Sensing and Geographic Information Systems is a veritable tool in environmental assessment including assessment and monitoring of land degradation most especially in a coastal zone.

Keywords: Land degradation, Remote Sensing, Geographic Information Systems, Assessment, Coastal zone, Monitoring.

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270 - HYDROLOGICAL DATA MANAGEMENT IN THE UNITED KINGDOM

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In many parts of the world, demand for hydrometric data is increasing, in response to a range of policy drivers and scientific challenges such as climate change. However, funding and support for monitoring networks and data acquisition systems is under pressure, adding to the challenges of providing reliable data to water managers and policy makers.

The National River Flow Archive (NRFA) is the UK's principal database of hydrometric information. The aim of this paper is to introduce data management initiatives employed by the NRFA to maximise the utility of hydrometric data for a broad community of end users. Many of the issues encountered in the UK will have resonance with data managers and users in other countries, so the data management principles we present in this paper have potential for application in other hydrometric networks.

We consider all stages in the flow of hydrometric information from field data capture through to dissemination and ultimately decision making. Firstly, we

discuss a hydrometric network appraisal system designed to influence network evolution and categorise catchments according to their strategic potential - an example being a 'benchmark' network of near-natural catchments, designated to enable the characterisation of climate-driven regime changes. We then discuss the various challenges of capturing hydrometric data in the UK, before introducing the quality assurance mechanisms employed by the NRFA, including hydrograph visualisation techniques and set of quality control metrics designed to monitor and improve the quality and completeness of hydrological time series. We then provide examples of techniques employed to monitor hydrological conditions over a range of timescales, from monitoring of contemporary conditions in times of drought or flood, through to appraisal of long-term trends and variability. Finally, we give an overview of systems for data dissemination, focusing on dynamic access to time series and spatial datasets via the world wide web. We underline the importance of providing appropriate metadata and guidance on the quality and the limitations of data to users.

Keywords: data management; database; hydrometric network; quality control; time series; dissemination

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272 - NECESSITY, PREREQUISITES AND PROBLEMS AT RENEW THE ACTIVITY OF INFORMATION SOVIETIZATION SYSTEM FOR PROGNOSTICATION OF IRRIGATION SCHEDULE DATA

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The Information Sovietization System (ISS) for prognostication of irrigation schedule when available water meets full crop water requirements was established and successfully functioned in Bulgaria from 1981 to 1990. Later it was created the model for prognosticate of irrigation schedule under conditions of water deficit.

The basic elements of this model are presented in the paper. The object of discussion is the possibility to actualize the model and to achieve a higher and more correct level of irrigation management. In this working there are included some new elements as:

1 Prognostication the yields (on the basic of relative relationships "yield - water").

2 Determination the optimal irrigation depth and amount of total water applied depending on the chosen criterion: maximum effectiveness of irrigation water or maximum economic profit (on the basic of the marginal product or marginal cost).

3 Optimization of irrigation schedule depending on available water resource.

Keywords: Prognostication, Irrigation schedule, Water deficit, Yield, Marginal product, Marginal cost.

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298 - MONITORING QUALITY OF THE IRRIGATION WATER

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In Romania the irrigated surface with high economic efficiency it is estimated at 3.5 mil. ha. On national scale there is no integrated approach of the quantity and quality values of the irrigation water, and resource, as well as an equipping of the pumping station. On international scale, in the developed countries the pumping stations are provided with equipment for monitoring, on real time, the quality or the pumped water and for warning about critical situations (emergencies).

The technical solution consists of an equipment which monitors the following parametres: turbidity, pH, CE at 25 °C, Na^+, Cl^-. The lapse of time for monitoring is of 10 - 60 min. The main components are the following: the prelevation pump (submersible) the monitoring board, the repression pipe of the analysed water. There are made warnings about tue exceeding of the programmed level for each

monitored parameter, about tue fact that the pump and agitator don't work or about any other source of damage.

The testing of the equipment in the ground was made at the base pumping station Manta, from the Danube Meadow, Giurgiu county.

The water is from the Danube and it is in most of the cases mixed with the water originating from drainage mixed with the drainage water.

The economic effects of the solution consist of the following issues:

- the decrease of the total content of soluble salts from the soil;
- the removal of the negative impact of the mineralized water upon the production level;
- the decrease of the alluviation degree of the irrigation arrangement site;
- the increase of the economic efficiency of the irrigation by including the water quality in the price.

The research is in accordance with the technological platform (PT)25 suits the tech. Plat the sector WSSTP - TWG4 water in agriculture. The problem was approached in the project 624/2005 from CEEX.

Keywords: irrigation, pumping station, monitoring, quality, equipment

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300 - INTEGRATED WATER MODELLING AND INTEGRATED TOOLS

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Water modelling involves a set of physical, chemical and biological processes, as

- meteorology, runoff, infiltration, leakage,
- both on soil, unsaturated fringe and aquifers,
- including underground evaporation,
- fissures, pores and matrix,
- three dimension density flow in marine areas or pollution contamination,
- null, partial or total solubility
- four phases, air, soil, water, oil for NAPL or pesticides, exchanges
- biochemical cycle of nitrogen, carbon and phosphorus

- biodegradability

Integration also concern tools and techniques as:

- GIS as the suitable tools to organize in a geo-referenced framework
- maps and data of basins systems
- satellite, and air remote imagery
- combined with database management system
- and flexible grid mapping
- in a permanent graphic interface
- registering pictures and films

Both integrations allow the user to forget the technical background to focus on natural and hazardous features.

The paper shows practical application of the integration of water, flows, processes and tools on large basins or local areas for an integrated water and pollution management and information.

Keywords: GIS - Water system - Hydrology- Unsaturated soil - underground aquifers - Pollution - 4 phases - fracturated rocks - matrix porosity - Nitrogen - Napl - Evaporation - 3D salt water - water modelling - basin water management.

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313 - MODELLING RUNOFF FROM MICRO-WATERSHED USING INTEGRATED KW-GIUH MODEL IN GIS

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Kanematic wave Geomorphological Instantanous Unit hydrograph (KW-GIUH) model for runoff simulation has been developed for ungauged or inadequately gauged watershed.The application potential of the developed model for runoff simulation was tested on a gauged second order agricultural micro-watershed in Almora district of Uttranchel state in India.The overall Root Mean Square Error(RMSE) associated with the simulated runoff rates by developed model was around a moderate value of 0.0023 m3/s.Out of the 51 test storms simulated,about 50% of simulated hydrographs were associated with well predicted total and peak runoff volumes.Besides this,30 hydrographs had good shapes and 10 hydrographs were associated with peak runoff times synchronized with their observed values.Analysis of the effects of storm-season,size,duration and their combinations revealed that this moderate performance of model was majorly

due to the incapability of the conventional rainfall excess determining SCS-CN method to account for the within-storm moisture changes.Sensitivity analysis of the subjectively assessed input parameters on a test storm indicated the curve number is the most sensitive input parameter and that it should be carefully parameterized for best performance of model.

Keywords:Runoff estimation,KW-GIUH, Calibration,Validation, Micro-watershed, GIS

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325 - UNCERTAINTY OF THE HYDROMETRICAL METHODS

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The current information related to the water sources regime and water demand is a basis for rational water resource systems management. Methods and technical equipments applied for this aim are different by type and quite various by their metrological characteristics. For this reason it is needed good knowledge of their possibilities and field of practical application. By the recommendation of the International Organization for Standardization (ISO) the uncertainty of results should be used as an estimation of the measuring methods and equipments. In order to facilitate the use of this category by the working specialists in hydrometrical practice in this report are given its main theoretical basis and some investigations of the most wide used hydrometrical methods. The presented results are usable as information for their metrological quality assurance and suitability for the purposes of the operative management and water resource system balances.

Keywords: Uncertainty, Measurement and Data, Flow Measurement, ISO

332 - GIS-BASED DATA MANAGEMENT AND DECISION SUPPORT SYSTEM FOR ARTIFICIAL RECHARGE PLANNING IN SEMI-ARID REGIONS

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The GABARDINE project ("Groundwater Artificial Recharge Based on Alternative sources of wateR: aDvanced INtegrated technologies and managEment"; EC FP6 STREP) focuses on artificial recharge of groundwater in semi-arid regions. Groundwater resources are the main source of freshwater, especially in the Mediterranean basin. During dry periods, or because of different human industrial and agricultural activities, different pressures are exerted on aquifers. Overexploitation, accidental or long-term pollution may appear leading to several problems such as seawater intrusion, wetlands deterioration, base flow reduction, biogeochemical changes, and chemical status degradation. In order to fight against these negative pressures, alternative sources of water have to be explored and evaluated from environmental and economical perspectives. The use of aquifers as the primal facility for large scale storage of water coming from these identified alternative sources should be then investigated. Different techniques of artificial recharge and injection of water, a quality and quantity monitoring network, as well as natural purification and filtration processes need to be studied.

One of the main expected outcomes of the GABARDINE project is a GIS-based Decision Support System (gDSS) aiming at planning artificial recharge projects in the context of Integrated Water Resources Management (IWRM). The gDSS is composed of several modules: Data Management, DPSIR Analysis, Artificial Recharge Planning, and Toolbox. One of the main elements of the system is a Geospatial Database, which guarantees that all necessary hydrogeologic geospatial data and information are acquired, stored, managed, and transferred in a proper way. The applied project-oriented approach enables a precise outlook on data and their good management for one hydrogeological project in its entirety. First, regional and geographical data as well as available equipment such as wells, trenches, galleries and others are stored. Then, results of a monitoring may also be recorded: primary observations and measurements retrieved in the field using precisely located sensors. Finally, the description of a hydrogeologic system by different field tests results, interpretations and derived data coming from the tests is made available for further analyses.

As one of the first tools available for a direct decision-support, the GABARDINE DSS proposes to structurally describe the faced water management problem in a given region according to the DPSIR framework (Driving force, Pressure, State, Impact, and Response) proposed and supported by the European Environment Agency. It enables groundwater resources problem decomposition, analysis and description, establishing a chain of causal links between Driving forces (economic sectors, human activities), Pressures (emissions, waste), the physical, chemical and biological State of the environment and Impacts on ecosystems, human health and natural resources, so as to identify the most relevant Responses to be given and to evaluate their efficiency from a socio-economic point of view. In order to proceed with the DPSIR analysis, a direct link with the Geospatial Database is established.

Once the problem is decomposed and analyzed, the decision maker establishes different alternatives of responses to the identified causal chains of pressures-sate-impacts, within the artificial recharge context. The proposed responses need to reduce significantly the impacts of identified pressures on the environmental state degradation. In order to evaluate the efficiency of these responses in terms of decrease of the system vulnerability to given pressures, internal or external tools such as analytical or numerical models, simulations, scenarios evaluation and multi-criteria analysis are available.

The paper is divided in three main parts. Firstly, it describes the main concepts that governed the development of the Geospatial Database. Then, it presents the application of the European DPSIR framework used for water resources problem analyses. Finally, it introduces first steps in conceptualization and design of a Decision Support System with its tools such as any numerical models or multi-criteria analysis, illustrated by first use cases.

Keywords: hydrogeological information, geomatics, artificial recharge, decision support system, DPSIR, integrated water resource management, multi-criteria analysis

344 - MODERNIZATION OF HYDROLOGICAL NETWORK IN SERBIA

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Within the cooperative program of Norwegian support to Serbia, the Hydrometeorological Service of Serbia (HMSS) in cooperation the Norwegian Water Resources and Energy Directorate (NVE) has implemented in 2007 a project concerning modernization of national hydrological network in Serbia.

The project's aim has been to support the HMSS, which is a specialized organization of the Government of Serbia, in reviewing and redesigning the hydrological network in Serbia in accordance with the assessed users' needs and requirements for hydrological data and information in the country. Within the project implementation, as a first step, a thorough review of current status of the network has been carried out, which was followed by an assessment of current and near-future needs of the key users of hydrological data. Eventually, a comprehensive draft proposal for the network redesign and overall modernization was prepared.

Solutions proposed in the draft document have been tested at the two forums specifically organized for the purpose, i.e. the National Round Table on Modernization of Hydrological Network in Serbia (4 September 2007, Belgrade, Serbia) and the Regional Workshop on Modernization, Operation and Maintenance of hydrological networks in the West Balkan region (6 & 7 November 2007, Belgrade, Serbia). Based on outcomes of these gatherings, final document on modernization of national hydrological network in Serbia is being prepared. It will serve as a basis for (a) elaborating a detailed action plan for modernization of network in Serbia, including design of structures and specification of equipment; (b) securing the necessary funds; and (c) implementing newly designed national hydrological network in the country.

The paper discusses the proposed modernization of hydrological network in the country. In this context, it presents results of analysis of the current status, concluding inter alia that the network is in need for further expansion; the structures at most stations (e.g. staff gauges, shelters for equipment, buildings, cableways, bridges for hydrometric measurements, etc) are in need for either repair of complete reconstruction) while the equipment used for hydrological measurements and data transmission is in urgent need for replacement with modern digital sensors, data loggers, and data transmission devices. Further on, the paper describes major findings concerned with the assessed users' needs for hydrological data and information, including conclusions of the National

Round Table and the Regional Workshop, both concerned with modernization of the network in the country. Lastly, the paper presents major features of the redesigned hydrological network, and conclusions with recommendations on the way forward aimed at modernizing hydrological network in Serbia.

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384 - INITIATING WATER MONITORING AS PART OF ENVIRONMENTAL MONITORING NETWORK IN ALBANIA

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Environmental monitoring of Albania has been relatively limited due to the political and historical events and poorly developed national facilities. Within the framework of StEMA-project (Strengthening of the Environmental Monitoring System in Albania, EU Cards), sophisticated EU-compatible monitoring network was developed in 2006-2008. StEMA monitoring scheme is based on assessment of existing hydrological monitoring network, international reporting demands and available expertise. Monitoring design is composed of 63 monitoring areas for six environmental components within the country. The area locations were selected based on a rough grid, primary river basins, existing literature, historical monitoring locations, map assessments and site visits. The monitored parameters, included in the six monitoring components, were defined on the basis of European standards, European Union directives and international agreements aimed at harmonizing the established monitoring with European practices. Within the network, water monitoring was initiated in pilot style of studies in 2008, during which transects and field monitoring schemes were established. The hydrobiological monitoring scheme composed of field studies of phytoplankton, benthic diatoms, macrophytes, benthic invertebrates and fish.

Keywords: Environmental monitoring network, Albania, European practices, water monitoring

386 – RIVER MONITORING SYSTEM IN MACEDONIA – RIMSYS PHASE 2

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The second Phase of the River Monitoring System in Macedonia (RIMSYS II) is a continuation of the co-operation project between the Republic of Macedonia and Switzerland. This Project aims to enhance the process of modernization of the governmental river monitoring system in Macedonia.

The achievements in the second phase of the Project RIMSYS are:

- Completion of the RIMSYS network (18 automatic stations) with latest state-of the art-technology;
- Training of HMS staff in Germany for a self-dependent installation of the automatic stations;
- Installation and Commissioning of the automatic Hydrological Stations;
- On-Line presentation of Hydrological data from RIMSYS Station on the HMS website with a Internet module;
- Modernization of the River Forecasting System - Integrated Flood Forecasting, warning and response system IFFWRS (integrating additional precipitation and river data, meteorological parameters ground-based radar or satellite data);
- Data dissemination of Real-time data and publication of historical data, primarily through the publication of hydrological yearbooks. Increase the interest of potential end-users of hydrological and ecological data.

Keywords: RIMSYS, monitiring, automatic station

388 - GIS DECISION SUPPORT SYSTEM FOR FLOOD CONTROL IN URBAN AREAS

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In large urban areas, floods are generated not only by the upstream rivers but also by the extreme rainfall events inside these areas or on the surroundings slopes.

The objective is to understand the most various and complex aspects of flooding in urban areas and to offer knowledge and tools for supporting the stakeholders decisions and solutions.

During extreme rainfall events some areas of Bucharest, are susceptible to be hit by urban floods. The growth of the city, especially in the northern part (new residential areas on former forests) can be seen on satellite images. The sewage capacity is sometimes over passed and lower parts of Bucharest are flooded. Two areas represent the case studies with flood problems, corresponding to two major pipes, B1 and B3.

A step in solving this problem might be represented by a Decision Support System (DSS) based on GIS. The DSS is based on two important components: **1.** a geodatabase that contains all important spatial (geographical), meteorological and hydrological data, showing the relation between Bucharest and the river basin it is part of; **2.** a model of the sewage system run with these data for different rain scenarios. The results will show where the system is put under pressure and under what circumstances. These results are stored in the geodatabase as well.

In this concern, the delineation of the runoff sub-catchments for the sewage system, the slope of the terrain and of the streets, the flow direction and accumulation was done in ArcGIS using the numerical terrain model. This is the component with the highest weight in the sewage system modeling. Other important components were also introduced in the model: the pipes and junctions networks with their characteristics (shape, dimensions, slope, material, roughness, incoming flow, invert elevations, inlet and outlet offsets and others) and rainfall time series. The geometric component of the sewage system was done by automatic and manual digitization in ArcGIS on the base of paper maps and satellite images.

Once the core of the model (sewage network) was ready, a special attention was given to the building of the time series from the intensity-duration-frequency curves. After running the model with several rainfall scenarios, the locations were the network is put under pressure are identified and the water volume that is

exceeding the network capacity are evaluated. On the base of these results, different solutions were imagined like reservoirs, cleaning of the pipes and manholes etc.

Keywords: DSS, GIS, Sewerage system, IDF, urban flooding.

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390 - WEB-BASED MOBILE SERVICE FOR MEASURING PARAMETERS AND ESTIMATING EUTROPHICATION OF THE LAKE PRESPA

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Mobile Web Services are very useful and handy in many ways, especially in gathering and distributing a small, but very important amount of information. A specific task can be launch, such as measuring data from distance monitoring object, and sending specific messages about the state of the eutrophication for critical alarming values. In this paper we present the usability of Web-based mobile service in Ecology, for measuring main characteristic parameters and estimating eutrophication of the Lake Prespa. We have develop a mobile service that allows for online monitoring and retrieving data from an Information System database, that serves as a pollution monitoring system, and sending alarm messages for define critical measured values for estimated eutrophication state of the Lake. At the same time this mobile service must provide services for any kind of mobile device. To make this achievable, we have created this service in a .NET environment, which is very flexible and capable of adding new mobile web pages.

Keywords: Lake Prespa, mobile, service, monitoring, eutrophication, messages, web server machine.

392 - APPLICATION OF AEROSPACE MONITORING CENTER (ASMC) IN RISK MANAGEMENT OF NATURAL HAZARDS IN BULGARIA

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The main responsible agency for the risk management of natural hazards in Bulgaria is the Ministry of State Policy of Disaster and Accidents. Aerospace Monitoring Center (ASMC) at the Ministry is a first satellite data receiving center built up in Bulgaria. The Center was opened in July 2007 and its main aims and tasks are focused on monitoring, risk and disaster analysis as well as damage assessment. The center is equipped with two receiving satellite ground stations (one for NOAA - AVHRR and Feng-Yun - MVISR, and second for TERRA/Aqua - MODIS) for real time data receiving and processing. In addition satellite images from Disaster Monitoring Constellation (DMC) are delivered to ASMC by Internet after download and processing. ASMC use the leading geographic information systems ArcGIS and appropriate for the task digital maps of Bulgaria.

The paper deals with the primary results obtained in the activity of ASMC in Bulgaria and application of Aerospace Monitoring Center (ASMC) in risk management of natural hazards in Bulgaria.

Key Words: Aerospace Monitoring Center, Bulgaria, Remote Sensing, Risk Management

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394 - MONITORING SAHELIAN TEMPORARY PONDS USING MODIS/TERRA IMAGERY

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Several studies showed that remote sensing data appear as an appropriate solution for accurately locating ponds over large areas, but there are few studies

on the temporal aspect to monitor their dynamics. Here, we presented a method to monitor ponds hydrological dynamics (filling/emptying) in arid lands using a time series of MODIS/TERRA images.

We studied two consecutive rainy seasons 2001 and 2002 for which we had corresponding measurements of daily water level data on several ponds. The study was conducted within a radius of approximately 13*13 km around the village of Barkedji (15.22° N, 14.86° W) located in the Ferlo region in North-East Senegal. This area is characterized by a complex and dense network of ponds that are filled during the rainy season. To evaluate MODIS images ability to capture pond dynamics, we calculated the correlation between the NDVI pixel value and the water level data collected at three ponds (Mous, Furdu and Barkedji) using an empirical temporal cross-covariance method. The temporal study showed very good results with a maximum of cross-covariance (Mous: cov=0.69; Furdu: cov= 0,77; Barkedji: cov=0.83,) for Δt=-6 days for Mous and Furdu and Δt=-10 days for Barkedji pond, suggesting that multi-temporal MODIS-NDVI data can prove very efficient for monitoring the state and dynamics of little ponds (about 2000 m^2) in arid lands.

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395 - TOWARDS THE DEVELOPEMENT OF A REGIONAL WATER OBSERVATION MECHANISM IN THE MEDITERRANEAN REGION

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Stakes related to water resources and demand management in the Mediterranean countries have always been huge. These stakes are continuously increasing, faced with risks related to climate change, such as the development of prolonged drought and water scarcity.

In such a context, access to reliable and relevant information is increasingly essential to support any water resources management and risk prevention policy, whether at the national, international or local level.

After 10 years of successful collaboration between the Euro-Mediterranean countries on the sharing of information on know-how in the water sector within EMWIS, the Water Directors of the Euro-Med countries requested a feasibility study, with the interested countries, regarding a "regional water observation mechanism in the Mediterranean region for monitoring the indicators towards the achievements of the Millennium Development Goals related to water and

sanitation (MDG 7) in the Mediterranean, as well as on the implementation of the "water" related section of the Mediterranean Strategy for Sustainable Development -MSSD-, based on information coming from the national water information systems, when they exist." (ROME, 2005).

The feasibility study was launched in the 2nd half of 2006 and is ending in December 2007. The 1st results relating to the analysis of the current situation and the expectations were validated during the conference of the Water Directors of the Euro-Mediterranean countries and of South-East Europe in Athens, November 2006.

During the study, the national consultants - expertise was mobilized to work with the national and local stakeholders in 7 countries (Morocco, Spain, France, Tunisia, Cyprus, Malta and Jordan). In the Mediterranean area, most of the international water-related initiatives were interviewed and some of them participated in a regional workshop, held in July 2007, with experts and representatives of the national institutions. This workshop allowed to carry out a technical assessment of results achieved and the analysis of data acquisition processes on some key topics: access to drinking water supply and sanitation (one of the Millennium Development Goals - MDGs-); water component of the Mediterranean Strategy for Sustainable Development; water and agriculture; drinking water supply and sanitation utilities; drought/water scarcity; impact of climate change. After the workshop, a detailed analysis of the production processes of the 5 priority indicators on Water and Sanitation of the MSSD was carried out in collaboration with 5 voluntary countries and UNEP/MAP/Blue Plan.

An international Steering Committee monitored the study implementation and provided advice. A Website was created during the study to facilitate exchanges between experts and to demonstrate some functionalities of the mechanism: www.semide.net/medwip. A short demonstration will also be available during the conference.

This note summarises:

- Problems based on findings on the current situation and on the stakeholders' expectations

- Constraints and opportunities

- A vision of the Mediterranean water observation mechanism project

Keywords : Information system, Semide, Emwis, Mediterranean

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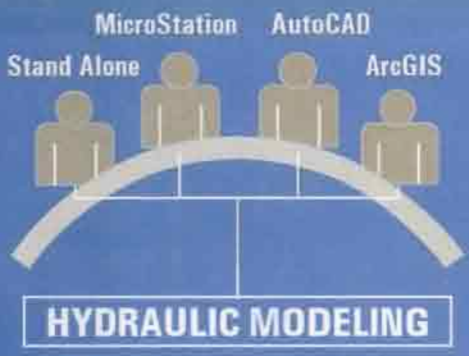

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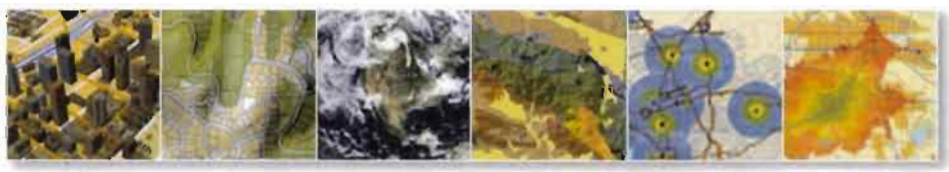

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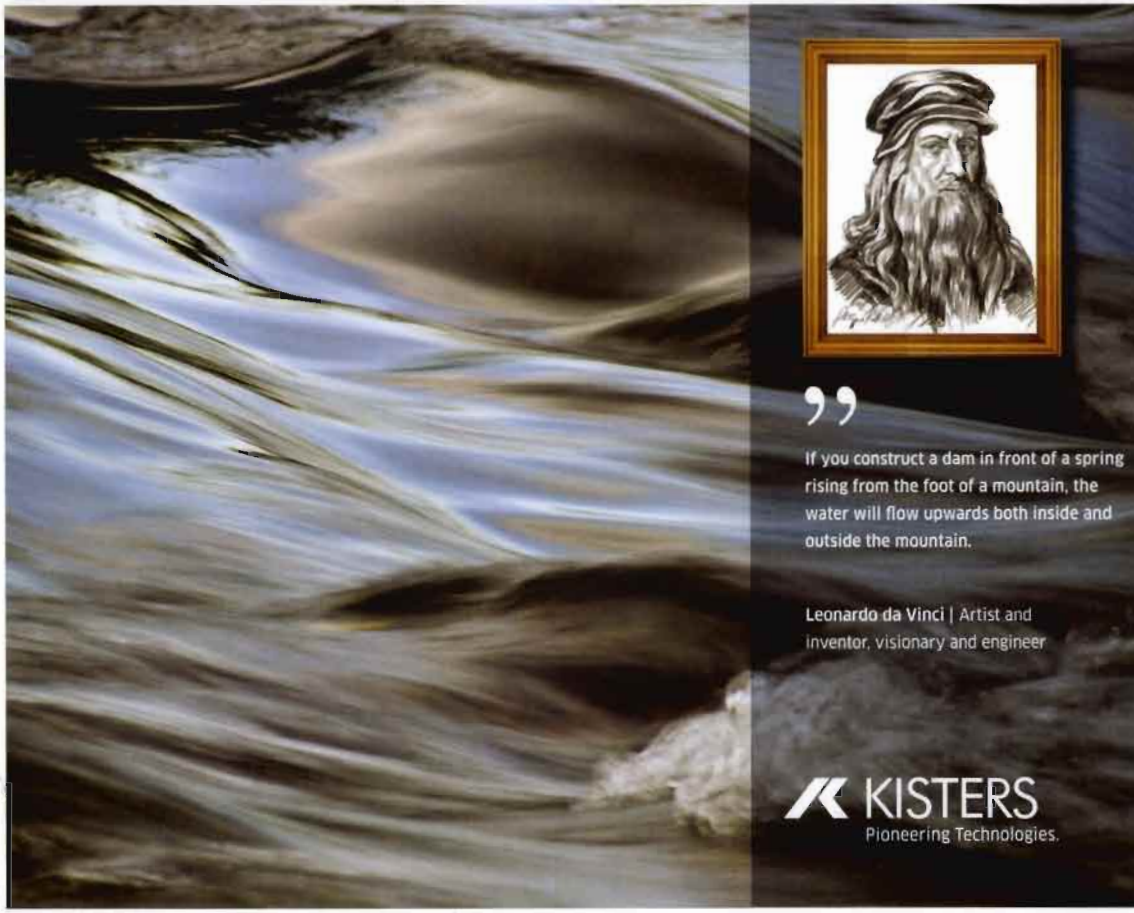

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If you construct a dam in front of a spring rising from the foot of a mountain, the water will flow upwards both inside and outside the mountain.

Leonardo da Vinci | Artist and inventor, visionary and engineer

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