17th International Symposium on
Environmental Pollution and its Impact on Life in the
Mediterranean Region

ABSTRACT
BOOK

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Mediterranean Scientific Association of Environmental Protection

September 28 to October 1, 2013
Istanbul – Turkey

17ᵗʰ International Symposium
on
Environmental Pollution
and its Impact on Life in the Mediterranean Region

September 28 to October 1, 2013, Istanbul - Turkey

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Air quality and pollution

Air Pollution & Art

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The history of air pollution can be traced through the examination of works of art and literary sources. For example, paintings by the Venetian Vedutisti, who strictly represented the reality as it was in front of them, clearly show the presence of black crusts on the buildings of the city suggesting at that time a significant level of pollution [1]. Similarly, literary descriptions made by writers already in Roman times may provide indications on air quality in certain locations [2]. Photography and movies often provide documentation of recent and current air pollution.

Contemporary art often expresses concern regarding air pollution and it is another evidence that also non-scientists have a negative perception of it and might want to take an action against it. Many artists support through their work environmental campaigns and exhibitions of works of art related to the theme of pollution are worldwide showcased.

Many environmental activists promoted actions against pollution to stress the importance of keeping air contaminants away from buildings and monuments. Such is the case of the Lanterna of Genoa (Italy) that can be proposed as an example of a monument located in a Mediterranean city rich of historical buildings threatened by pollutants emitted by a variety of sources (harbour, traffic, industries, power plants) located in the proximity of the urban inhabited area.

Monuments and historical buildings are not the only kind of artworks affected by pollution. Works of art stored in museum environments are exposed to indoor pollution. A specific sector of art conservation and art conservation science, called preventive conservation, is devoted to monitor environmental parameters in museums, historic buildings, libraries and archives, to the development of suitable showcases for museum objects and to the establishment of practical measures to be adopted by museum staff that help in guaranteeing the preservation of our cultural heritage for future generations. The challenge of preventive conservation lies in compromising between allowing access and use of the heritage and better conditions for its preservation.

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Keywords: air pollution, art conservation, public engagement, preventive conservation

Airborne inorganic pollutants deposited on conifer needles and building facades: reconstruction of spatial and temporal variations of the impact of an EAF steelmaking plant on the surrounding territory

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In the evaluation of the improved efficiency in off-gas abatement systems of industrial plants it is not possible to rely only on instrumental measurements if no data are available regarding the past pollution scenario. Moreover, covering wide territories with instrumental monitoring stations could be cost and time consuming. Hence, an alternative approach was developed to evaluate how large was in the past and it is nowadays the area of impact on air quality of an electric arc furnace (EAF) steelmaking facility located in Northern Italy. In a pilot study, bulk and single particle analytical techniques were combined to identify the distinctive characteristics of the particulate matter emitted by the plant. Iron-rich spherical particles often containing other heavy metals (Zn, Mn, Cr, Ni, Pb, Cu) were identified as markers of the dust emitted by the plant, while from the elemental point of view Mn, Zn, Cr and Pb and secondarily Fe and Cu were identified as possible indicators of contamination from the industrial activity. The pilot study has also been used to try to develop a methodology to provide quantitative data from the measurements obtained by these "passive" samplers that could support the calibration of dispersion models.

Then, conifer needles and building facades in the area surrounding the plant were sampled and used respectively as archive of recent and less recent information on local air quality. The markers of pollutants emitted by the steelmaking plant were detected and comparison were made between their concentrations in different areas and periods of time in relation with changes in the off-gas abatement system undertaken by the industry. An attempt to associate different kinds of detected particles with specific stages of the steel production process was made in order to understand the relative significance of process and fugitive emissions for air quality in the area.

To have a more detailed description of the spatial impact of the industrial activities particulate matter was studied with subsequent higher magnification. Where no traces of the steelmaking activities were detected by scanning electron microscopy coupled with energy dispersive x-ray spectroscopy (SEM-EDXS), the samples were analyzed with the higher resolution of transmission electron microscopy coupled with energy dispersive x-ray spectroscopy (TEM-EDXS) and selected area electron diffraction (SAED) in order to make sure that no smaller particles, able to travel farther from their source, were present at the location that could be apportioned to the steelmaking plant.

All data provided by electron microscopy analysis were discussed in the context of elemental concentrations measured with bulk analytical techniques such as inductively coupled plasma atomic emission spectroscopy (ICP-AES). The benefits of combining the two analytical approaches emerged especially for the discrimination of the emissions from different sources.

Keywords: Conifer needles, electron microscopy, steelworks pollution, particulate matter, heavy metals

Healthy Buildings-Dream or Reality?

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Asthma, allergy, cardiovascular diseases, sensory and other neurological effects were associated with indoor air pollution (IAP); for some of them (in particular children's respiratory disease and mucous membrane irritation) relationships with exposure to IAP are reported. In the last twenty years much effort has been put to evaluate the quality of the indoor environment and to quantify the possible health risk for humans living under conditions of poor indoor environmental quality. Several projects have financially been supported by the European Commission and the member states with the aim to identify and quantify the main indoor air contaminants and their sources, to evaluate the impact of ventilation regimes on the concentration of priority chemical and biological compounds indoors and to assess the exposure to these compounds and a potential risk for health. In the course of these developments an additional factor, the saving of energy, for homes and public buildings has become an important criterion for the overall quality of buildings. The need to construct air tight buildings in order to save energy often lead to an accumulation of indoor air contaminants and has changed the overall philosophy for healthy indoor environmental quality. The necessity emerged, in particular, for low emitting construction and building materials in accordance with Community directives or regulations along with the adaptation of appropriate ventilation regimes to ensure well being and comfort of the building occupants.

EU and WHO directives/policies relevant for good indoor air quality are:

The Energy Performance Building Directive [91/2002/CEE]
The Construction Products Regulation (CPR) [305/2011/CEE]
The guidelines for indoor air quality (WHO/2010)
The EU Green Paper on Smoking ban

Despite the fact that some issues still remain open or under consideration e.g. on how to efficiently facing indoor environmental problems related to the increased needs for energy saving measures, on the development of low emitting construction and building materials and the definition of harmonised criteria and methodologies to evaluate indoor environmental quality, there are positive signs and approaches from science and policy. There are also substantial efforts made from the industry to adopt relevant regulations, which are necessary for a smooth internal market. In addition, in the last years the awareness of consumers for ecologically friendly products has substantially increased.

In the presentation past and current actions to improving indoor environmental quality will be reviewed with focus onto priority air contaminants indoors and on progress made regarding reduction/elimination of emissions of construction and building materials widely used in confined spaces. Moreover, suggestions and recommendations will be given on how to tackle the issue of indoor environmental quality in view of the new multi-annual work programme of the Commission Horizon-2020.

Keywords: Healthy buildings, indoor environmental quality, building materials

Scavenging Mechanisms of Atmospheric Pollutants

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Wet and dry depositions are well described in the literature as the main scavenging mechanisms for atmospheric pollutants as elements, compounds (inorganic and/or organic), ionic constituents, etc. A lot of studies have been reported for the characterization of different areas (rural, urban, industrial) in terms of wet and dry deposition in order to assess the importance of each one to the scavenging process. Wet fluxes (monthly or yearly) of the atmospheric chemical species depend on their concentration in rainwater collected and the rain depth of the episodes.

The scavenging of gases and particulates from the atmosphere, in absence of rain or fog, takes place by a number of simultaneous phenomena (turbulent flow, boundary layer transport, chemisorption on surface), which are responsible for the dry deposition of the above pollutants. This is related to the pollutant's concentration (measured in the dust collected or as gases) and its deposition velocity. In the present work monitoring data from chemical analysis of rainwater and dust collected in an urban area have been treated to estimate the domain scavenging atmospheric mechanism (wet or dry) and the total fluxes of the pollutants studied on yearly level. The study of the wet to dry deposition ratio indicated the wet deposition as the main scavenging mechanism for the majority of the pollutants examined for the area under the maditerranean meteorological conditions.

The wet deposition accounted for about 50% to 80% of the total deposition (wet+dry) for the majority of the chemical species studied.

Keywords: Wet/Dry deposition; Deposition fluxes; Deposition velocity

Mechanistic exposure assessment of traffic-originated ultrafine PM

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Exposure to PM has been associated to both acute and long-term health effects; however the lack of in-depth understanding of the mechanisms of toxicity obscures targeted risk management and it most likely results in overly conservative risk management. This study aims at the development of a methodology for refining PM exposure by incorporating a detailed particle number exposure model coupled to a lung deposition model, accounting for differences in PNC that are not always reflected by mass concentration measurements in terms of actual exposure.

The study includes a set of UFP measurements and exposure modelling including deposition across the respiratory tract. The UFP measurements were carried out in two urban sites in the city of Thessaloniki. The first one was at the curbside of an intensely trafficked road (Egnatia Avenue, Venizelou square) and the second one at the suburbs of the city (Eptapyrgio), representing the urban background concentration. In both sites, fixed monitoring stations of the regulatory monitoring network exist, providing average daily data for PM10 and PM2.5. PM concentration data comprise the input for the detailed exposure model (activity based inhalation rate dependence is also incorporated). The output of the exposure model is the input for the lung deposition model, for estimating the distribution of deposition for the particles of several aerodynamic diameters. Our measurements indicated that there is very rapid decline on the particle number from the centre of the street towards the roadside, accompanied by a less significant decrease in the overall mass concentration, indicating the formation of larger particles towards the roadside. For comparison, the annual PM10/PM2.5 concentrations for the two stations are 54/38 μg/m3 (traffic station) and 33/23 μg/m3 (background station) respectively. Although the PM10/PM2.5 ratio between the two sites does not differ substantially, the differences are much larger when it comes to PNC (77149 and 32459 particles/cm3 respectively) – the corresponding UPFs mass concentration at the traffic and the background station is estimated equal to 5.9 and 2.4 μg/m3 respectively.

The results indicate that differences in exposure between the two measurement sites correspond to different patterns of deposition within the lower respiratory tract. In fact, the overall deposition is almost four times higher at the traffic site vs. the urban background site. This variation is, however, not reflected in the overall UFP PNC, nor in the PM10 and PM2.5 mass concentrations daily monitored in the respective sites. Our findings show that exposure to tailpipe traffic emissions (characterized by lower GMD) corresponds to increased internal exposure/deeper lung deposition compared to traffic exposure at the curbside and beyond. Thus the same magnitude of PM exposure in mass concentration will result in different response based on whether this corresponds to a low or high particle number, especially with regard to health effects relevant to UPFs translocation, such as cardiovascular disease. In conclusion, refined PM exposure -response functions could be developed if a holistic exposure-oriented framework as the one presented herein was used to associate PM loading in the ambient air to adverse health outcomes.

Keywords: Ultrafine particles, exposure, lung deposition, air pollution monitoring

Temporal variation of inorganic pollutants at working offices in METU

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Indoor concentrations of ozone (O3), nitrogen dioxide (NO2) and sulphur dioxide (SO2) were measured with passive sampling at 32 sampling locations in classes, offices and hallways of the Environmental Engineering Department (ENVE) in Middle East Technical University (METU) for one weekday periods. 16 outdoor samples were also collected around the department, during sampling campaigns. Two passive sampling campaigns, one in summer between 24 and 28 May 2010 and the other one in winter between 21 and 25 February 2011 were performed.

Temporal profiles of the indoor and outdoor concentrations of the measured inorganic pollutants were evaluated. Indoor to outdoor concentration ratios (I/O) of O3, SO2 and NO2 pollutants have varied in a range from 0.07 and 0.92, and from 0.14 and 2.60, and from 0.31 and 2.53 in summer, respectively. I/O ratios of these compounds were also obtained to vary in a range from 0.04 and 0.39, and from 0.08 and 0.78, and from 0.24 and 2.09 in winter, respectively. During the winter season, I/O ratios of O3, SO2 and NO2 were found lower than one at almost all sampling points, only except that restroom due to combustion source. Therefore, sources of the target compounds in the building indicate the importance of outdoor sources during the winter season. Decreasing in the ventilation in the building and increase in the outdoor concentrations of SO2 and NO2 due to fossil fuel combustion for heating purposes are the possible reasons of low I/O ratios cross the department in winter. However, due to increase in temperature and solar radiation, the stability of the atmosphere decreased and as a result of this, outdoor VOCs concentrations were measured at low level in summer season. In the current study, average I/O ratios of O3, SO2 and NO2 were obtained as 0.26±0.08/0.25±0.15; 0.37±0.18/1.02±0.66; 0.60±0.36/0.92±0.49 in winter/summer, respectively. Therefore, lower outdoor concentrations and increase in the ventilation and penetration of the gaseous pollutants into the building are possible reasons of the measured higher I/O ratios of SO2 and NO2 during the summer season than those in winter. On the contrary, as the outdoor ozone concentrations were also increased as a result of the rising photochemical activity in the atmosphere in the summer, a temporal variation could not be observed for I/O ratio of ozone.

In the present study, any significant variation in the indoor concentrations of target compounds could not be observed among the stores of the building during the winter season except for the ground floor where restroom was. High SO2 and NO2 concentrations were observed at the ground floor both in winter and summer seasons due to rest room. Moreover, clear seasonal variations were observed for the measured mean ozone concentrations at different stores in the building probably due to differentiation of ventilation. Consequently, outdoor sources seem to be very effective on the concentrations of the target inorganic compounds within the building. Moreover, meteorology and ventilation of the building are other driving factors which have important effects on the variation of concentrations in the ENVE building.

Keywords: O3, SO2, NO2, indoor pollution, temporal variation

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Integrated Modelling System to predict exposure of office workers

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Given the fact that people in the developed world spend ~90% of their time indoors, and the recognition of the significance of indoor air on human health by setting guidelines for selected pollutants (WHO, 2010) it is important to be able to assess exposure to indoor air pollutants and to estimate the likely impact on health. However, exposure models typically focus on primary pollutants such as nitrogen dioxide, whereas there is increasing evidence that secondary pollutants are more likely to cause adverse health effects indoors (e.g. Carslaw et al., 2009).

This work reports on the modelling aspect of OFFICAIR, a project recently funded by EU FP7. Within the framework of the OFFICAIR project, an integrated approach has been developed to evaluating the health risk of office workers from indoor air pollution. The integrated modelling system links emissions of key pollutants (ozone, primary VOCs and particles) and major secondary indoor pollutants, which are known for their adverse health effects, to their concentrations in modern offices and eventually to the assessment of exposure of office workers, via a suite of modelling tools.

This advanced and unique modelling chain is designed for application in all regions of Europe. The modelling system will provide access to different modelling approaches, including a deterministic or probabilistic approach, based on the concept of microenvironment or CFD modelling, and considering either lumped or advanced indoor air chemistry. This approach allows different models to be applied, depending on the data available for parameterisation and the focus of study, which can range from individual rooms or buildings to population exposure.

More specifically, the following modelling approaches have been developed and then integrated:
a. Modelling of ventilation rates in modern offices (generic modelling using COMIS);
b. Modelling of indoor concentrations in office environments, based on:
• Deterministic modelling of indoor air pollutants with lumped chemistry (MIAQ/UOWM model);
• Probabilistic and deterministic modelling of indoor air pollutant concentrations (INDAIR-CHEM model);
• CFD modelling of spatial distribution of pollutants and coupling of energy requirements and IAQ.
c. Estimates of population exposure.

Examples will be presented from the application of the system, in different office types in Euroepan countries. For the parameterisation of the models, the outdoor air quality data derive from the European Airbase database, whereas the ventilation rates of the buildings from the Review report carried out within OFFICAIR.

Keywords: Indoor chemistry; modelling; exposure assessment

Atmospheric conditions associated with high and low summertime ozone concentrations in the free lower troposphere and the boundary layer over some eastern Mediterranean airports

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Thanks to the vertical atmospheric measurements of the MOZAIC (Measurement of Ozone and Water Vapor by Airbus in Service Aircraft) program, enhanced ozone mixing ratios in the lower troposphere over the Eastern Mediterranean have been found, frequently exceeding the 60 ppb, 8-h EU air quality standard, whereas ozone between 700 hPa and 400 hPa was only slightly (3–5 ppb, 5–10%) higher than over Central Europe.

In order to evaluate the observed high rural ozone levels in the Eastern Mediterranean area during summertime, vertical profiles of ozone measured in the period 1994-2008 in the framework of the MOZAIC project over the Eastern Mediterranean basin (Cairo, Tel-Aviv, Heraklion, Rhodes, Antalya) were analyzed, focusing in the free lower troposphere (1.5-5 km) and also in the boundary layer (0-1.5km). At first, vertical profiles collected during extreme days with very high or very low tropospheric ozone mixing ratios have been examined together with the corresponding back-trajectories. Also, the average profiles of ozone, relative humidity, carbon monoxide, temperature gradient and wind speed corresponding to the 7% highest and the 7% lowest ozone mixing ratios for the 1500-5000m height layer for Cairo and Tel-Aviv have been examined and the corresponding composite maps of geopotential heights at 850 hPa have been plotted. Based on the above analysis, it turns out that the lower tropospheric ozone variability over the Eastern Mediterranean area is controlled mainly by the synoptic meteorological conditions, combined with local topographical and meteorological features. In particular, the highest ozone concentrations in the lower troposphere and subsequently in the boundary layer are associated with large scale subsidence of ozone rich air masses from the upper troposphere under anticyclonic conditions while the lowest ozone concentrations are associated with low pressure conditions inducing uplifting of boundary layer air, poor in ozone and rich in relative humidity, to the lower troposphere. Comparable patterns of ozone variability are also observed within the boundary layer.

In general, the maximum vertical ozone concentrations during days of highest ozone mixing ratios over all the examined Eastern Mediterranean airports are observed above the boundary layer at 2-3km altitude. Within the boundary layer, ozone is decreased on average in all airports, especially in Tel-Aviv and Cairo, which might be attributed to the influence of nitrogen oxides originating from local urban pollution, to the atmospheric particles of mainly natural origin (e.g. desert dust) or to the dry deposition on the ground. Other meteorological processes within the boundary layer (e.g. sea-breeze) might have an important influence on the ozone variability, depending on the particular location characteristics. The results of our analysis show that the influence of tropospheric ozone on both the boundary layer and surface ozone values, mainly through the process of atmospheric subsidence, is quite variable among the examined Eastern Mediterranean airports with the highest impact detected over the Aegean Sea airports of Heraklion and Rhodes.

Keywords: Tropospheric ozone, boundary layer ozone, Eastern Mediterranean

Determination of Ambient Levels and Sources of Volatile Organic Compounds in an Industrial Region at the Aegean Coast of Turkey: Study Area and Data Set Description

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The atmospheric volatile organic compound (VOC) levels and sources in an industrial area at the Aegean coast of Turkey were determined. For this, VOC concentrations were measured at two monitoring stations through winter and summer campaigns in 2005 and 2006 at Aliağa industrial zone. One of the sampling stations was located in downtown Aliağa and the other one was established downwind of industrial facilities, approximately 500 m to the south east of Horozgediği village. After the summer sampling, another temporary station was installed in between petrochemical complex and petroleum refinery to generate source profiles of petrochemical complex and petroleum refinery. Approximately 50 VOCs were measured at each station. Three dataset constituted of nearly 227 000 VOC data has been generated from the hourly and half hourly measurements with online gas chromatographs.

The VOC levels of all three stations are compared with the other industrial sites in the literature. The concentration levels in Aliağa and Horozgediği are found to be lower than the other industrial regions reported in the literature.

Keywords: Aliağa, industrial site, VOC, online GC, petroleum refinery, petrochemical complex.

Effect of the Asphalting Operations on the VOC Load of the Bursa Urban Atmosphere

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Ambient concentrations of VOCs with carbon numbers varying between 2 and 12 were measured with online GC in Bursa, which is the fourth largest city of Turkey. Two measurement campaigns were carried out between 14th of September to 6th of November in 2005 and 17th of March to 10th of May in 2006. About fifty one VOCs were regularly determined in each sample. In the two sampling campaigns, alkanes and aromatics were dominant groups, with high percentage of contributions (31.5% and 37.36%) and (31.48% and 34.25%), respectively. Alkenes were the second highest group (22.05% and 23.33%), followed by halogenated VOCs and alkynes (1.82% and 3.4%) and olefins (13.16% and 1.77%). However, a different pattern was observed during about 30-day period (21th September–21th October) within the first sampling campaign. At the beginning of the 30-day period very low concentrations of VOCs especially for light VOCs were measured until October, 10 due to asphalting operations on Atatürk Avenue, one of the main avenues of Bursa, which is the very close to sampling location and other closer streets. During the asphalting operations, the avenue was closed off to traffic and traffic route was changed therefore especially exhaust originated VOCs such as benzene, acetylene, 1,3-butadiene were determined at low level during this period. On the contrary very high concentrations of some heavy hydrocarbons such as 1-octene, 1-nonane, dodocane and n-dacene were detected during this period. During the sampling campaigns, the worst atmospheric conditions (i.e., the lowest mixing heights, lowest ventilation coefficients, the most stable weather conditions) were observed especially in March. Although assimilative capacity of the atmosphere was the worst in March in Bursa, the highest Total VOC concentrations were observed in October and daily total VOCs concentrations reached to about 380 µg m-3 during the asphalt operations. Hence, asphalting operations may have led to an increase in VOCs concentrations in the surrounding atmosphere. Consequently, in addition to effect of the meteorology, source strength is also very important on the measured VOCs concentrations in atmosphere. Another important issue is that these heavy hydrocarbons were measured higher concentrations during the weekend than the weekday for the first campaign. Normally, as traffic density will be higher in weekdays than the weekends, it is expected to the concentration of the traffic originated pollutants are higher on weekdays than the weekends. Probably, paving works were performed during the weekend; these heavy hydrocarbons were obtained at high level on the weekend as compared to weekday. Furthermore, Positive Matrix Factorization (PMF) analysis was also performed to identify sources of the measured VOCs in Bursa urban atmosphere during the study. PMF results show that asphalting operation source appear in separated factor and contribute to about 26% of the total VOC concentrations in the first campaign.

Keywords: VOCs, Asphalting Operations, PMF, Urban atmosphere, Active sampling

Culturable airborne bacteria and isolation of methicillin-resistant coagulase-negative *staphylococci* from outdoor environments in Istanbul, Turkey

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The aim of this study was investigating the composition of Staphylococcus species at different 11 locations in Istanbul during the year of 2009 and their resistance profiles to methicillin and other antimicrobial agents. Sampling points were selected for the collection of airborne bacteria, based on the specific activity of the area in different parts of Istanbul. Airborne bacteria were collected by impaction onto a Plate Count Agar and Mannitol Salt Agar, using a portable "Microbial Air Monitoring Sampl'air" (ISO 14698 validated). A study on ambient air levels of bacteria and the influence of meteorological factors on total culturable airborne bacteria concentration have been carried out at 11 different locations of Istanbul. Highest bacterial levels were observed at station BK (1100 CFU/m3) followed by station BHC (1040 CFU/m3) and the lowest at different stations 10 CFU/m3. In the study GIS has been used to demonstrate the spatial bacterial concentration measured in sampling stations. Results were also analyzed using GIS techniques for different measurement periods and analysis results were presented in the study. Among the meteorological factors – temperature and relative humidity were indicated the pronounced effect on bacterial concentrations with positive correlation.

Phenotypic antimicrobial resistance was determined using the disc diffusion method on Mueller–Hinton agar according to CLSI guidelines. None of the isolates were resistant to imipenem, amoxicillin clavulonic acid, furazolidon, vancomycin (IPM, AMC, FR, VA). A total of 15 Staphylococcus species were isolated and tested for antimicrobial resistance, and maximum MAR index value (0.4) is Taksim station in April. Results suggest that there may be a systematic difference in bacterial populations between coastal and central location of city.

Keywords: Airborne bacteria, *Staphylococcus*, antimicrobial resistance, GIS, İstanbul.

Ambient VOCs Levels and Their Sources in Two Different Industrial Cities and an Industrial Town in Turkey

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Recent years have seen a dramatic increase in attempts to determine ambient volatile organic compounds (VOCs) due to their direct adverse effects on human health and urban air quality. The most significant source of VOCs in urban location is from vehicular exhaust emissions; however VOCs have also entered the atmosphere as a result of gasoline evaporation, industrial processes, fossil fuel combustion, oil refineries and the use of solvents. VOCs levels in urban especially depend on their traffic load, population and present of industrial plants. Hence VOCs concentrations and their sources of urban atmosphere have varied from one city to another even located in the same country.

Ambient concentrations of VOCs were measured using passive sampling technique at about 50 points in two crowded city (namely Kocaeli, Bursa) with a population over 1.5 million and one small town (Aliağa) with a population around 100,000. The common characteristic of these regions contain the largest number of huge industrial plants (e.g. automotive, textile industrials, petroleum refineries, a petrochemical complexes, ferrous scrap processing steel plants) in Turkey. The weekly passive samplings were performed in june and july 2006 and in June 2007 in Aliağa, Kocaeli and Bursa, respectively. Air samples were analyzed using thermal desorption (TD) and gas chromatography/flame ionization detectors (FID). Concentrations of aromatic VOCs, such as benzene, toluene, ethylbenzene, m/p-xylenes, o-xylene, 1,3,5-trimethylbenzene, n-propylbenzene, 3-ethyltoluene, and 4-ethyltoluene, were compared to determine effect of the population and industrial facilities on the urban air quality.

BTEX concentrations in Kocaeli were relatively high in comparison to Bursa and much higher than Aliağa region. Total VOC levels ranged from 5-387 µg/m3, 6-183 µg/m3 0.2-12 µg/m3 in Kocaeli, Bursa and Aliağa. The most important characteristic of Kocaeli is a foremost city having more 1000 industrial plants, 300 of which are huge; its population density is 398 people per km2 (the second city in Turkey) and its annual population growth rate is 27‰.Hence the high number of population related to vehicular emissions and industrial plants were much more affected on urban air quality than the size of the industrial plants. A Principle Component Analysis (PCA) using a receptor-oriented source apportionment model was separately applied to the VOC data. The identified sources of VOCs in Bursa include vehicle emissions (47%), heavy duty vehicles with diesel engines (11%), evaporative emission (8%) and industrial emissions (14%). The main sources of Kocaeli are gasoline vehicle emissions and landfill area (43%), use of industrial solvent (16%), traffic and industry mixed (13%), industrial process losses (10%). There are three main sources extracted for Aliağa region such as vehicular exhaust (45 %), refinery emissions (28%) and industrial sources (27%). The source comparisons can also help identify differences in the magnitude of emissions pollutants in the examined locations. The explained factors indicated that the urban airs measured in these locations were influenced by both traffic and industrial sources, each of which displayed different levels.

Keywords: Passive sampling, Principle Component Analysis (PCA), VOCs, Urban atmosphere

Evaluation of indoor air pollutants in modern office buildings in Hungary

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In modern office buildings there are a lot of materials that can be considered as major contributors of volatile organic compounds (VOCs) to the indoor environment. This study, conducted in the frame of European OFFICAIR project, aims at evaluating the concentration of VOC and aldehydes emitted by materials in offices of different European countries. In this study, indoor and outdoor VOCs and aldehydes measurements are performed in two field campaigns (winter and summer period) in European countries and the results are presented and discussed. The field campaigns correspond to weekly measurements. Passive diffusive samplers were used for collecting thirteen hydrocarbons (benzene, toluene, ethylbenzene, m,p-xylene, o-xylene, n-hexane, trichloroethylene, tetrachloroethylene, α-pinene, limonene, 2-butoxyyethanol, 2-ethylhexanol, styrene), seven carbonyl compounds (formaldehyde, acetaldehyde, acrolein, proprionaldehyde, benzaldehyde, glutaraldehyde, hexanal) as well ozone and nitrogen dioxide.

This paper is focused on the data collected in Hungary and on the difference in the indoor concentration between winter and summer.

The evaluation of indoor concentration show that five compounds (toluene, α-pinene, limonene, hexanal, acetaldehyde) as well ozone are higher in all buildings than the threshold of 5 µg/m3, all other compounds are below this level. Therefore VOC and aldehyde indoor pollution could be restricted to the evaluation of 5 compounds.

Usually outdoor concentration of all VOCs was lower than the indoor one. For some compounds, the concentrations increased from summer to winter as in the case of limonene. Outdoor limonene concentration in the monitored buildings was low in summer and winter season (in the range of 2-3 µg/m3); however, limonene indoor concentration in winter increased to 43 µg/m3, while in summer this range was between 2 and 7 µg/m3. It is clear that the sources of limonene came from inside the buildings the external concentration values being always low. Thus, it can be stated that indoor limonene concentration showed a seasonal behaviour.

For the other compounds, there were variations in their concentration from summer to winter. The formaldehyde outdoor concentration is very low (below 4 µg/m3) and almost constant in winter and summer. The formaldehyde indoor values are present in the range from 8 to 18 µg/m3 and had not significant seasonal variations. This means that the sources came from indoor but the production, diffusion and depletion balance has a different kinetic from that of limonene.

Outdoor ozone concentration has seasonal behaviour (maxim values in summer in the range of 30-86 µg/m3 and minimum values in winter 10-20 µg/m3), while the indoor mean value is very low (summer 10-20 µg/m3, winter 1-2 µg/m3 respectively. In this case the contribution of indoor sources is negligible in comparison with outdoor. In most cases, the indoor / outdoor ratios were higher for NO2 - which has only outdoor sources - than for O3 which also indicates the higher reactivity of ozone in the indoor environment.

Comparison of extracts of air and house dust samples applying on-line and off-line SFE approaches

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In order to investigate whether the content of low and non-volatile organic compounds in house dust is qualitatively similar to low and non-volatile organics in air, SFE (Supercritical Fluid Extraction) extracts of airborne organics adsorbed on PUF (Polyurethane Foam) plugs, sampled in a house, were compared to house dust extracts of the same location, collected on the same date.

The on-line extraction mode, SFE combined with gas chromatography - mass spectrometry (GC-MS), was chosen for the extraction of the sorbent on which air/organics had been collected. Due to the high sensitivity of the online mode, relatively low gas volumes (a few m3) were required for the extraction. The on-line SFE extraction at different CO_2 densities did not yield the expected pre-separation results. Therefore, the sorbent was extracted only once, with supercritical CO_2 of density 0.90 g/ml, using PUF as sorbent. The house dust sample was extracted off-line, using a method consisting of a two-step SFE with CO_2 and CO_2 + 5% of methanol, and GC-MS analysis of the eluates.

Whereas the air samples partially contain organics in the vapor phase and partially adsorbed on suspended particulate matter, organic compounds in the settled dust samples are obviously adsorbed in dust particles. The volatile compounds are either predominantly in the vapor phase or desorbed from house dust during sample collection. The less volatile the compound is, the distribution between vapor phase and house dust is more in favor of house dust. However, the analysis showed a high degree of similarity between the compounds identified in the two samples (on-line SFE of the air sample, off-line SFE of the house dust sample). From the total number of compounds detected, more than 70% of them were found common in both samples. The compounds detected only in the air sample were either polar volatiles, or semi-volatile lipophilic compounds that still had a relatively high vapor pressure. Although the on-line SFE was expected to provide a higher sensitivity, very few compounds, from those detected in the air sample were not detected in the house dust sample. The chromatographic separation of the air sample was found to be poor, compared to that of the off-line SFE house dust extracts.

Keywords: SFE- CO_2, house dust, indoor air

Air quality prognosis using artificial neural networks modeling in the urban environment of Volos, Central Greece

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It is well known that natural and anthropogenic emissions of ambient pollutants affect air quality and as a consequence the public health. Various epidemiological studies are identified particulate matter (PM10) and surface ozone (O3) as key air pollutants, triggering adverse health effects on humans. The objective of this study is the prognosis, one day ahead, of air quality in the urban Volos area, a medium sized city at the eastern seaboard of Central Greece, using Artificial Neural Networks (ANN).

For that purpose, two ANN forecasting models are developed. The first ANN model is appropriately trained to forecast the mean daily PM10 concentration of the next day, while the second one to forecast the maximum daily surface ozone's 8-hour moving average concentration of the next day. For both ANN models training, the mean daily relative humidity (%), the mean daily air temperature (oC), the mean daily wind speed (m/s), the mean daily PM10 concentration (µg/m3) and the maximum daily surface ozone's 8-hour moving average concentration (µg/m3) are used. Meteorological and air quality data are acquired from the Volos air pollution-monitoring station with fully automated analyzers installed by the Hellenic Ministry of the Environment, Energy and Climate Change (HMEECC), covering the time period 2001-2009.

Results indicate that ANN modeling is a promising tool at an operational planning level for the State officers in order to forecast air pollution and protect public health. Concretely, the coefficient of determination was found to be 0.476 in case of PM10 prognosis against 0.856 for O3 prognosis. Besides, the index of agreement was found to be 0.777 for PM10 and 0.958 for O3 forecasting, which indicates that the forecasting concentrations are very close to the observed concentrations. In any case, the statistics analysis showed that the predictive ability of the proposed ANN forecasting models is very good at a significant statistical level of $p < 0.01$.

Keywords: Air quality, ANN modeling, Volos, Greece

Spatial and Temporal Analysis of Black Carbon Aerosols in Istanbul Megacity

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In a world where at least 50% of the population is living in urban environments, air pollution and specifically particulate matter (PM) became one of the most critical issues. Recent studies suggest that chemical composition is critical in understanding the effects of PM on health as well as climate. Black Carbon (BC) is an important component of PM due to its effects on human health and climate. BC plays a key role in the atmosphere due to its chemical and optical properties. In recent studies, such as the UNEP "Integrated Assessment on Black Carbon and Tropospheric Ozone", BC is a central species in pollution mitigation strategies, due to its short atmospheric lifetime. It has been shown that BC reduction measures can provide substantial public health and environmental benefits, faster than reducing greenhouse gases. However, monitoring networks and measurement campaigns to quantify BC concentrations in the atmosphere are limited. In this study, we present the first BC concentrations measured in the Istanbul megacity (~15 million inhabitants). Air pollution especially originating from vehicle traffic is critical for public health in the city (over 3 million vehicles on-road). Two measurement campaigns were conducted to measure BC and PM2.5 concentrations at four locations, characterized by different traffic densities. In the first campaign, BC daily mean concentrations were found to be between 4 µg/m3 and 10 µg/m3. In the second campaign, BC and PM2.5 were measured at the site with the highest traffic density for an entire year (annual average BC: 13 µg/m3 and PM2.5: 36 µg/m3). Analysis of diurnal variations of BC concentrations and traffic density revealed a significant correlation (correlation coefficient of 0.87). These measurements is essential to identify the sources of BC and PM2.5 concentrations in Istanbul and develop mitigation measures. In addition, the impact of megacities, like Istanbul, on climate change has been investigated in several recent studies (e.g. "MEGAPOLI" and "CityZen") and BC measurements are extremely important to reduce the uncertainties in the emission inventories and to support model results.

Keywords: Black Carbon, Traffic, Exposure, Fine Particulate Matter, Istanbul Megacity

A study of high Particulate Matter concentrations episodes in the Megacity of Istanbul using a fine resolution CMAQ air quality modelling simulation

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Although clean air is identified as one of the basic requirements of human well-being, air pollution remains one of the major health risks, especially in megacity urban environments. In this respect, it is critical to identify the sources of high pollution events in megacities in order to develop efficient mitigation measures, for both air quality and climate change. Istanbul is one of the largest cities in Europe and the Mediterranean. The emissions of air pollutants from Istanbul into the atmosphere are determining severe pollution episodes, especially for particulate matter (PM) winter concentrations. The main objective of this study is to quantify the impact of emissions on air pollution in Istanbul. In order to accurately determine the effect of different emission sources, anthropogenic emissions inventories at different spatial resolutions are utilized using an advanced air quality model (Community Multiscale Air Quality model, CMAQ) coupled with WRF meteorological model. In particular an episode of high PM pollution observed in Istanbul during the winter of 2011 is simulated using two different emission inventories, the TNO/MACC_2005 (horizontal resolution of ca. 10 km x 10 km), for a region covering the Eastern Mediterranean, combined over Istanbul with a high resolution inventory (2 km x 2 km) developed in the frame of the European Union FP7 project CityZen. The results of the model simulations are compared with measurements of PM2.5 and black carbon (BC), which were performed in Istanbul during 2010-2011, as well as other major pollutants. In particular, we have investigated a winter episode (1-14 January 2011) with high BC and PM concentrations. At a downtown site of Istanbul, BC and PM2.5 daily mean concentrations were measured, ranging from 8 μg/m3 to 19 μg/m3, and from 23 to 50 μg/m3, respectively. Measured daily average PM10 concentrations reached 89 μg/m3 within the investigated episode. The sensitivity of PM concentrations in Istanbul to anthropogenic emission inventories with different horizontal resolutions, and the impact of locally emitted versus transported pollutants are presented in this study.

Keywords: Black Carbon, PM2.5, air quality modeling, Istanbul Megacity, emission inventory

Calculation of CO$_2$ Emmisions Originating From Forest Fires Through The Use of Remote Sensing Images: Antalya Case

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Forest fires are one of the most important emergencies for world considering their effects and destructive results on the natural environment. Especially high summer month temperatures and nature of vegetation cover causes many forest fires in Turkey. On the other hand, lack of effective or timely response causes thousands hectares of forest areas burn down. Most appropriate areas allowing forest fires get on and spread easily is the zone which is under the effect of Mediterrenean climate. In addition, the forest fires causes to lose carbon pool which plays an important role in the mitigation of climate change. This study examines the case happened between 07/31/2008 and 08/05/2008 for six days in Serik, Antalya. That forest fires were recorded as the second and fourth biggest forest fires ever happened in Turkish lands. Destructed area is defined by using Landsat 7 ETM+ satellite images by applying supervised classification and NDVI. The carbon losses caused by fires at Antalya Serik Region and CO2 amount caused by destruction of sinks according to IPPC - Guidelines for National Greenhouse Gas Inventories. By the utilization of the emmision factors, burnt areas helped us to determine SO2, NOx, PM10, CO and non-methane VOCs for the further assessment affected residential areas in the periphery. Then, air quality modeling is used to define fire-originated pollutants and their effects on the surrounding areas; to determine critical areas; and to calculate ground – level concentrations. To accomplish these, CALPUFF model, which is a Lagrangian non-steady state dispersion model is used. With the help of this study, all residential areas which affected by the fire incident is determined.

Keywords: Forest Fires, Remote Sensing, Air Quality Modelling, Geographical Information Systems, NDVI

Derivation of PM10 Levels using Landsat 5TM Images: A Case Study in İzmir, Turkey

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Remote sensing is a convenient technique to manage air quality and used to determine local and wide range spatial distribution of PM10 data. Determination of PM10 data using multispectral satellite images' reflectance values is the aim of this study. 19.02.2010 and 26.03.2011 dated Landsat 5TM multispectral satellite images and in-situ air quality measurement stations' PM10 data of İzmir were used. The highest, lowest and average PM10 values are 172, 92.5 and 124.4 µgm-3 in 19.02.2010 and 64.5, 31 and 48.7 µgm-3 in 26.03.2011 respectively. The subtraction of land surface reflectance (LSR) images obtained by atmospheric correction from top of atmosphere reflectance (TOA) images was computed to generate the difference reflectance images to correlate and analysis with PM10 values. The band ratio of 1650 nm centered Mid-IR 1 (band 5) and 2315 nm centered Mid-IR 2 (band 7) was generated from difference reflectance images and found to be highly correlated with PM10 data. The correlation coefficients between PM10 and band 5/band 7 ratio values were found 0.94 and 0.84 in 19.02.2010 and 26.03.2011 respectively. The result shows that, the band 5/band 7 ratio values of Landsat 5TM are more correlated and appropriate to determine PM10, if PM10 values are high as in 19.02.2010.

Keywords: Air quality, PM10, Remote sensing, Izmir

An Investigation and Comparison on Energy Efficiency Design Index (EEDI) and Energy Efficiency Operational Indicator (EEOI) of Some Ships

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Ships have played an indispensable role on world issues for centuries. Shipping has the major part of the world trading system. For they can carry a great amounts of goods, ships are the most preferential vehicles for trading. Besides trading, shipping sector produces vehicles for military, entertainment and fishing purposes. On the other hand, shipping sector is one of the main reasons for climate change and it has a considerable effect on human health and environmental issues. For ships' use the heaviest fuel on the world, they can produce great amount of gas emissions. Many of the emissions are very dangerous for human health and environment. Although ships have a little share of gas emissions compared to land-based produce, due to their activities mostly occur near the coast and port cities, shipping emissions must be considered. There are many scientific studies on ship emissions and their impacts. International Maritime Organization (IMO) is the main authority to prepare new regulations and rules. In order to make a realistic comparison between ships, IMO formed two important calculation systems: Energy Efficiency Design Index (EEDI) and Energy Efficiency Operational Indicator (EEOI). While EEDI is developed for new design ships, EEOI is developed for ships in operation. However, for EEDI is a progressive calculation, it can be implemented to operational ships.

In this paper, EEDI and EEOI calculations made for some operational ships and thus, environmental performance of these ships are investigated. In consideration of regulations, some suggestions are made for the ships that have a poor rate for environment.

Keywords: Efficiency Design Index, Energy Efficiency Operational Indicator, Ship

Size distribution of atmospheric particulate inorganic species at an urban site in the Central Balkans (Belgrade)

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Size-fractionated urban aerosol samples were collected in Belgrade city center during summer-autumn 2008 using six stage High Volume Cascade Impactor. The particle size ranges for each stage were the following: $Dp \leq 0.49$ μm, $0.49 \leq Dp \leq 0.95$ μm, $0.95 \leq Dp \leq 1.5$ μm, $1.5 \leq Dp \leq 3.0$ μm, $3.0 \leq Dp \leq 7.2$ μm and $Dp \geq 7.2$ μm. During investigated period urban aerosol was sampled every sixth day and a total of 32 samples were taken, each comprising of six aerosol subsamples according to aforementioned particle size ranges. In order to determine aerosol mass concentrations aerosol samples were submitted to gravimetric analysis. Subsequently, exposed filters were used for determination of water soluble inorganic ions. One fifth of each filter was sonicated with 5 ml of ultrapure water. The concentrations of sodium (Na^+), magnesium (Mg^{2+}), calcium (Ca^{2+}), potassium (K^+), ammonium (NH_4^+), chloride (Cl^-), nitrate (NO_3^-), suphate (SO_4^{2-}) and phosphate (PO_4^{3-}) were determined by ion chromatography.Size distribution of aerosol mass mocentratiosn is bimodal with maximums in the fine mode ($0.49 \leq Dp \leq 0.95$ μm) and in the coarse mode ($Dp \geq 7.2$ μm), which is in accordance with urban aerosol distribution. Regarding mean total particulate concentrations of water soluble inorganic species sulphate (2236.5 ±1243.4 ngm-3) was the most abundant in the investigated aerosol samples followed by ammonium (1397.9 ± 726.0 ngm-3), nitrate (846.8 ± 333.3 ngm-3), potassium (192.6 ± 87.8 ngm-3), chloride (192.1 ± 121.6 ngm-3), calcium (85.4 ± 43.9 ngm-3), sodium (28.4 ± 46.5 ngm-3), phosphate (10.6 ± 5.5 ngm-3) and magnesium (3.7 ± 1.8 ngm-3). Obtained results show that sulphate, ammonium, potassium are predominantly present in the fine fraction, $Dp \leq 1.5$ μm, which represents, on average, 91.5%, 84.4%, 74.4% of the total particulate atmospheric concentrations, respectively. A large fraction of atmospheric particulate nitrate (69.2%), phosphate (67.5%) and chloride (66.5%) is also present in the fine mode of particles. Calcium and magnesium are not preferably present in either fine or coarse particle modes. Namely, 51.6% of particulate calcium and 46.3% of particulate magnesium is in the fine fraction and 48.4% of particulate calcium and 53.7% of particulate magnesium is in the coarse fraction. On the other hand, sodium is present in significant amounts (61.3%) in the coarse fraction, $Dp \geq 1.5$ μm.

Keywords: Size distribution, atmospheric particulate inorganic species, Belgrade, Aerosol samples

Emerging systems, in the era of financial austerity, for monitoring emission reductions with the capability of quantifying on real-time the exposure of citizens

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For more than 25 years the EU has produced legislation for emission reductions in member states. These efforts had produced various positive and negative outcomes. These results have been already superseded with the effects of limited financial austerity problems in limited urban and regional domains. However, in order to detect the consequences on air-quality the monitoring must be subjected to important technological and methodological breakthroughs. It must become more relevant to society benefit areas and indicate on real-time individual human exposure. This work identifies advancement in distributed architectures for tele-monitoring and how these integrated technologies overcome the limitations for constructing low-cost devices that are capable to measure accurately hazardous gases.

These have been successfully embedded in small sensing terminals that carry communication and positioning instruments and interact with a variety of already deployed telecommunication services. These sensor networks are particularly useful for monitoring ambient outdoor and indoor air pollution with emphasis to enhance our knowledge on the health effects from accurate exposure assessment rather than epidemiological statistics. Because these terminal units can be used by different citizen groups it is now possible the quantification of health effects targeted at population groups that are sensitive to specific diseases. In this work we examine the:
• The temporal trends of atmospheric pollution related diseases.
• The geographic distribution of diseases or the causative exposures and the associated risks.
• The identification of people or groups who develop specific patterns of diseases due to their environmental exposure; eventually leading into identification of those at high risk.

Finally, an integrated environment and health Information Systems incorporating measurements from ground devices in very high temporal frequency can provide fresh incentives on innovative emission reduction application suitable to the society behavior changes caused by the spread of financial austerity policies.

Keywords: Emission reduction, real-time monitoring, air-pollution, financial crisis, citizens' exposure, and health effects

Seasonal variation of PM10 ambient air concentration correlated with meteorological parameters for the city of Kozani, Greece

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In the last decades there has been an increasing concern on ambient air particulate matter (PM) concentrations due to observed health problems caused by their high levels and the negative impact on the ecosystem [1]. Thus, EU has established regulations concerning PM10 and PM2.5 concentration levels with the 2008/50/EU directive. Eordaia basin, in western Macedonia, Greece, often suffers from air quality problems because of the four thermal power stations and their lignite mining activities. In addition, West Macedonia is a fast developing region with a growing population at the two main cities (Kozani and Ptolemaida). During the recent years many studies were carried out on particulate matter (PM) concentrations and their chemical characterization over this area and especially in the city of Kozani, the capital of the region which is in a close distance to the power plants [2]. For this reason in the present study, PM10 concentration levels in the city of Kozani (figure1) during warm and cold period of 2012 – 2013 were assessed. Thus, hourly PM10 concentrations were employed being collected by a ß-attenuation instrument (Environnement S.A model MP 101M) which was operated at the roof of the Environmental Technology Laboratory building (10 m high) which is close to the city centre and characterized as an urban background station. This work presents the seasonal and the diurnal variation of the above measurements. Also it explores the role of meteorological parameters, such as temperature, relative humidity, wind speed and wind direction on the recorded aerosol fraction.
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Keywords: PM10, seasonal variation, meteorological parameters, Kozani

Levels of Suspended Particulate Matter before and after the Economic Crisis in Thessaloniki, Greece

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Suspended particulate matter (PM) is a major environmental problem in several countries in the E.U., while new evidence regarding its detrimental impact on human health has emerged. The urban atmosphere contains high concentrations of suspended particulate matter (PM) due to different sources (vehicular traffic, residential heating, industrial activities, soil dust, secondary aerosol formation, etc). The economic crisis, which started at the end of 2009 in Greece, affected not only the citizens' financial status, but the air quality levels in the large Greek urban agglomerations, as well. Since 1989, a comprehensive network of six monitoring stations (three traffic influenced and three urban background stations at peripheral sites) has been established and operated by the Environmental Department of the Municipality of Thessaloniki, in order to monitor the levels of air pollutants in the city of Thessaloniki, northern Greece, located in an area with unfavorable meteorology.

Results have shown that during the last two decades, air quality levels in Thessaloniki, have risen due to population growth and increase of the car fleet.

In this work, we study the PM10 and PM2.5 concentration differences in the city of Thessaloniki, for two selective periods: the three years preceding the beginning of the economic crisis (2007-2009, before crisis period) and the three years following (2010-2012, after crisis period), when the crisis has still been evolving. The results showed that the overall air quality, as far as the PM levels is concerned, is poor in the city centre, while at the peripheral sites is moderate, during both periods. Nevertheless, a revealing finding is that during the after-crisis period and when the domestic heating is on, the mean diurnal variation of PM concentrations has changed and the hourly peak has been shifted to the late night hours. Moreover, for the same period, there is a significant increase of PM concentrations on weekends and holidays and an overall increase of 13% for PM10 concentrations and 25% for PM2.5. On the other hand, there is a significant decrease of about 20% in the after crisis period and when the domestic heating is off, indicating a cutback on vehicle emissions, which is the primary source of PM in urban Thessaloniki area.

Keywords: Urban air pollution, PM10 concentrations, PM2.5 levels, suspended particulate matter, economic crisis, air quality monitoring network.

Chemical composition and mass closure of the coarse particle fraction in the atmosphere of Thessaloniki, Greece

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In the present study, the chemical composition of the coarse particle fraction (PMc) was investigated at two urban sites in the city of Thessaloniki, one of which is located in the commercial city centre next to a busy road (urban-traffic site, UT) and the other in the upper part of the city (174.0 m asl), in a residential area around 800 m from the ring road (urban background site, UB). Concurrent samplings of PM10 and PM2.5 were conducted during the warm and the cold months of the year. PMc concentrations at the city centre were high compared to other major cities worldwide, averaging 20.5±7.2 and 23.5±10.8 µg m-3 at the warm and cold period, respectively, while PMc concentrations at the UB site appeared to be significantly lower (13.6±5.8 µg m-3 vs.10.5±6.0 µg m-3 in the warm and cold period, respectively). Minerals (Si, Al, Ca, Mg, Fe, Ti, K) accounted for 35.6-55.6% of total PMc and dominated coarse particles mass at both sites and periods, with Ca and Al being the most abundant. Organic matter (OM) exhibited significant contribution at both sites ranging from 12.5-17.9%. On the other hand, EC exhibited significant contribution only at the UT site (10.3% vs.5.4% in cold and warm period, respectively), while at the UB site EC accounted only for 1.9% and 3.7% of total PMc, respectively. Water-soluble inorganic ions were also determined (chloride, nitrate, sulfate, sodium, potassium, ammonium, calcium, magnesium) and their concentrations were used in order to calculate secondary inorganic aerosol (SIA) and sea salt (SS). SIA generally showed higher contribution at the PMc mass during the cold period (12.2% and 15.3% vs. 7.6% and 8.8% at the UT and UB, respectively), while trace elements (Mn, Co, Ni, Cu, Zn, Se, Sr, Sn, Te, Pb) exhibited insignificant contribution at the PMc mass, regardless the sampling site and period. In general, most chemical species did not exhibit statistical significant seasonal variations suggesting constant emissions throughout the year at both sampling sites. Finally, spatial variations of atmospheric concentrations of minerals and trace metals showed statistically significantly lower levels at the UB site, suggesting lower impact from traffic-related sources, as well as of metro construction works in comparison to the city centre site.

Keywords: coarse particles, chemical characterization, mass closure, carbonaceous species, PMc, urban background, seasonal variation

Distribution of volatile organic compounds in ambient air during the day and the night regime of the urban and suburban zone of Belgrade

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Volatile Organic Compounds (VOCs) are defined as a group of high vapor pressure hydrocarbons of various types and properties. VOCs include mainly non-methane hydrocarbons (NMHC), oxidized and halo-hydrocarbons. Biogenic and anthropogenic VOCs in ambient air affect the air quality in the regional scale and at large distances around the world. VOCs are well-known as precursors of the ground level ozone generated in photochemical reactions. They also contribute to the formation of photochemical smog, including secondary organic aerosol (Secondary Organic Aerosols - SOA). Most VOCs have carcinogenic, mutagenic and teratogenic properties. The major sources of VOCs are natural (biogenic origin) and anthropogenic (the comsumption of solvents, biomass burning, traffic...).

The study was conducted in the period April - May 2012, at the location of the central zone of Belgrade - Studentski Trg as well as suburban part of the city - Zeleno Brdo. The samples were collected using a passive sampling method for a period of 12 hours during the day and night cycles, using a combination of adsorbents Carbopack C/Carboback B/Carbosieve S111 which facilitates adsorption of the widest range of Cn. Analysis was performed by GC/FID/ECD (Agilent 7890) associated with the thermal desorber (Unity MARKES 1). The separation of the components was performed on a capillary column DB-624, 60 m length. For identification and quantitative determination of standard gas mixtures TO - 15 Scotty Analyzed Gases 110 L (62 components, each 1 ppm in nitrogen) was used.

The measurements show the differences in the contents of some volatile organic compounds measured in urban and suburban area of the city: for example in the suburban zone was observed the existence of 1,3 - and 1,4 - dichlorobenzene and increased levels of benzene and xylene, while in the urban area was observed the presence of carbon disulphide, hexane and methylene chloride.

On the other hand, there is a difference in the measured concentrations of VOCs during the day and the night regime. For example, methyl isobutyl ketone and n-octane in the urban area appear only during the night while the contents of o-xylene, trichlorethylene and ethyl chloride are significantly higher during the day. In the suburban area the concentration of benzene, heptane, 1,4-dioxin, benzyl chloride, di- and trichlorobenzene show the same dynamic appearance, while their concentration is higher in the daytime. Similarly, dibromo- and tribromomethane and tetrachloroethane also show the same dynamic appearance, except that their concentrations are higher at night.

Keywords: atmospheric pollution, VOC's, passive sampling, urban area, suburban area

Benzene Levels in the Atmosphere of Large Greek Urban Centers

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Aromatic hydrocarbons are produced in urban areas mainly from anthropogenic sources, with the largest proportion of those, coming from car emissions. Benzene is a known carcinogen and exposure to high ambient levels of this compound represents a considerable health risk. Unfortunately measurements of aromatic hydrocarbons, and in particular of benzene, are rare at the Greek cities, especially before 2000. This study presents a comparison between available benzene measurements that have been made in three different sized Greek urban cities, during a three year period (2009-2011), with the same measurement method (gas chromatography GC). The measurements were made, in central Athens, in eastern Thessaloniki and in a suburban area of Ioannina, by the Environmental Department of Municipality of Thessaloniki and the Greek Ministry of Environment (EARTH). However, it should be emphasized that the measurements refer to cities with different size, population and air pollutant emissions, as well as in different measurement areas, concerning the car traffic crossing adjacent to the measurement sites.

According to the results in central Athens, a gradual reduction is observed in the benzene concentrations from 2009 to 2011. In eastern Thessaloniki the benzene levels show minimal fluctuations (small upward trend), while in the suburban area of Ioannina a significant increase is observed in benzene concentrations, for the above period. Regarding the annual limit for benzene (5 μg/m3 - Directives 2000/69/EC and 2008/50/EC), only the annual 2009 benzene concentration (5.35 μg/m3) at the center of Athens had exceeded the threshold.

Keywords: Urban air pollution, Benzene levels, aromatic hydrocarbons, gaseous phase chromatography, seasonal and daily variation, air quality monitoring network.

Ambient levels of VOCs, including carbonyl compounds, and ozone at Cabañeros National Park, Spain

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Concentration levels of 15 carbonyls, 17 VOCs and ozone were studied at Cabañeros National Park, Spain, in an area mainly constituted by holm oaks (Quercus ilex) and cork oaks (Quercus suber), along with scrubland formations such as rock-rose and heather. The compounds were collected by means of diffusive samplers from August-November 2010 and February-August 2011. Carbonyl compounds, VOCs and O3 were analysed by HPLC with diode array UV-Vis detector, GC-FID and by UV-visible spectrophotometry, respectively. The most abundant carbonyls were hexanal, acetone-acrolein, formaldehyde and acetaldehyde. Seasonal variation was apparent with maximum values observed in summer months (see Figure 1). Total carbonyl concentrations ranged from 2.8 to 19.7 µgm-3. Most VOCs studied (using chemically desorbable cartridges) were either not detected or were below their detection limits, however, a parallel sampling using thermally desorbable cartridges, from May 22 to June 19, revealed the presence of much more VOCs, identified using GC-MS (see Figure 2). O3 concentration ranged from 27.2 to 90.5 µgm-3, reaching the maximum monthly mean concentration in March (84.4 µgm-3). Therefore, from the results from VOCs and carbonyl compounds it can be concluded that the sampling area located at Cabañeros National Park is not affected by pollution and it could be considered as the background concentration. However, the high levels of O3 found should be deeply studied in further investigations, in order to know its origin due to the extremely low levels of NOx that must have in the area.

Keywords: Air quality, Aldehydes, VOCs, ozone, passive samplers, Cabañeros National Park

Comparative evaluation of indoor VOC and aldehyde pollution in modern office buildings in different European Countries

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In modern office buildings there are a lot of materials that can contribute to volatile organic compound (VOC) emission to the indoor environment. This study, conducted in the frame of European OFFICAIR project, aims at evaluating the concentration of VOCs and aldehydes emitted by materials in office in different European countries. In this study, indoor and outdoor VOCs and aldehydes are determined in two field campaigns (winter and summer period) for example in Hungary, Greece and Finland and the results are presented and discussed in the present study. The field campaigns corresponded weekly measurements. Passive diffusive samplers were used for determination of thirteen VOCs (benzene, toluene, ethylbenzene, m,p-xylene, o-xylene, n-hexane, trichloroethylene, tetrachloroethylene, α-pinene, limonene, 2-butoxyyethanol, 2-ethylhexanol and styrene) and seven carbonyl compounds (formaldehyde, acetaldehyde, acrolein, proprionaldehyde, benzaldehyde, glutaraldehyde and hexanal).

The evaluation of indoor concentration show that only four species (toluene, α-pinene, limonene, and hexanal,) was higher in all buildings of three countries than the threshold of 5 μg/m3, the concentration of all other compounds was below this level. Acetaldehyde concentration was higher than the above-mentioned threshold only in Finland and Hungary, while xylenes was predominant in Greece. From this observation results that VOC indoor pollution could be restricted to the evaluation of the concentration of only 4 compounds for all three countries beside acetaldehyde for Hungary and Finland and xylenes for Greece.

Another results of this comparative study, regards the difference in the indoor concentration in summer and winter. Usually, outdoor concentration of all VOC was lower than the indoor one. For some compounds, for example, limonene, its levels increased from summer to winter, while for other compounds there were no considerable changes in their concentrations or slightly decreased. This observation is valid for all buildings irrespectively of their country origin. These different phenomena indicates that dynamics of production, diffusion and depletion by reaction of different species are different.

Ambient concentrations and chemical features of PMx due to the emissions of the consume by the central heating biomass

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Suspended particles originate from a variety of anthropogenic stationary or mobile sources as well as from natural sources. These particles may either be emitted directly or formed in the atmosphere by transformations of gaseous emissions such as sulfur oxides, nitrogen oxides and volatile organic compounds. Industrial facilities, motor vehicles and household combustion devices, are common particle matter (PM) emission sources.

Particles with aerodynamic diameter smaller than or equal to 10 μm (PM10), penetrate into the lungs, due to their small size, causing inflammatory reactions in the respiratory system. Several epidemiological studies have been published recording the relationship between the concentrations of inhalable (PM10) and respirable (PM2,5) aerosols and their composition, with adverse health effects particularly in the respiratory tract of humans.

In general, the particles comprise an inorganic phase (solid inorganic material, water-soluble minerals, elemental carbon, etc.) and an organic phase (organic carbon). Physical and chemical properties vary greatly with region, source category, as well as with time and meteorology.

Until 2011, Greek households were mainly heated by oil burning. The economic crisis of the recent years in conjunction with the simultaneous increase of the price of oil led the Greek families to change their way of heating and find economically affordable solutions. A financially more attractive option is the consumption of biomass but this choice eventually led to the deterioration of air quality of Greek settlements.

In the current work, an area influenced directly from the emissions of neighboring chimney of central heating system consuming biomass was selected to be studied. PM10, PM2.5 and PM1 concentration measurements were carried out for a short period of six days. PM temporal variation and the rate of attendance of finer particles in the fraction of PM10 over the studied period is presented and their chemical features are discussed focusing on the concentrations of Polyaromatic Hydrocarbons (PAHs) and Polychlorinated Biphenyls (PCBs). Finally, a comparison with corresponding values from other regions is also attempted.

Keywords: Air Pollution, PMx, biomass, chemical features

A forecasting meteorological modelling system for the identification of the Wind Days

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In the south-eastern part of Italy, Apulia Region, in proximity to the Taranto town (250,000 inhabitants), is located a large industrial site, consisting of an integrated steel plant (one of the largest in Europe), an oil refinery, a big cement manufacturing facility and other smaller industries, which all use Taranto harbour for raw materials unloading and final products delivery. During the last years a lot of limit value exceedances related to PM10 and Benzo(a)pyrene have been recorded in the densely populated neighbourhood close to this industrial area. Consequently, it was necessary to define a Regional Air Quality Recovery Plan (1). A study of these critical pollution events showed a close correlation with wind conditions, favourable to the pollutants transport from the industrial site to the adjacent urban area. An historical statistical analysis has allowed to define a criterion, based on meteorological measurements, for the daily identification of these events named "wind days". During such episodes, the Regional Air Quality Recovery Plan requires the industries to put into effect mitigation measures.

A forecasting meteorological modelling system was adopted to identify "wind days" in advance, in order to warn the industries. The numerical weather predictions are daily carried out with a maximum of 72 hours, coupling the prognostic non-hydrostatic meteorological model RAMS (2), initialized at 00UTC and updated every 6 hours by the global model NCEP, to the diagnostic meteorological model SWIFT (3). In particular RAMS is employed with a two-way nested grid configuration with three horizontal grids, each grid covering a different domain size. The innermost grid has a mesh size of 4 km. The downscaling of the RAMS prognostic fields to a finer resolution (1 km) and a smaller domain centred over Taranto is done through the model SWIFT. The performance of the modelling system was evaluated by comparing predictions and the hourly wind measurements from the regional air quality network for a period of six months. The statistical analysis shows a good capability of the model in reproducing wind field over the area. The predicted "wind days", which activated recovery measures, represent almost 70% of those real and produced a satisfactory improvements of the air quality.

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Micronucleus tests in mice exposed to Radon emissions in indoor conditions

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The aim of this work was to investigate the mutagenic effects of Radon-222 and its decay products in laboratory mice exposed in environmental conditions. In order to realize this objective, laboratory mice were exposed in buildings located in two small towns from Latium volcanic area, where Radon natural pollution is notoriously present in high concentrations. Biological effects of sub-chronic in vivo exposure can be identified through the analysis of cytogenetic damage. For this reason, attention has been paid to the genotoxic damage detectable through the application of the micronucleus test to Swiss CD1 strain mice exposed to Radon. The microunucleus test, a sensitive mutagenicity assay in vivo, was applied to the peripheral blood of mice immediately after the exposure time and in control mice of the same strain held in laboratory conditions on equal terms. Micronucleated erythrocytes (MN) frequencies were determined counting 2000 erythrocytes per animal. Five experiments were performed, exposing mice to Radon-222 for a period of about 30 days in two different premises: a house cellar in Ciampino (Rome province) and tufaceous cellar in Vetralla (Viterbo Province). The mice were placed in cages with food and water ad libitum and cotton wool for constructing a nest. Radon-222 concentrations were monitored continuously, through active and passive detectors to determine the mean value of Radon concentrations over the period monitored. After exposure, the mice were sacrificed and the micronucleus test was performed on peripheral blood. The micronucleus test, applied to a total of 58 adult animals, showed a statistically significant increase in the average MN frequency (MN/1000 erythrocytes) in mice exposed compared to the control values (MN frequency before exposure) in all experiments. The lowest value of exposure that caused a statistically significant increase in MN frequency was 700 kBq h/m3. A significant correlation between average MN frequencies and exposure to Radon-222 was also observed in adults (r = 0.71, p <0.001). The third experiment included also the exposure of three couples (Vetralla) and three female mice in an advanced state of pregnancy (Ciampino). In these conditions embryo-fetuses and newborns were exposed to Radon natural emissions for about 20 days. The average MN frequency in mice groups exposed perinatally to radon and its decay products was significantly higher than that observed in control mice. In newborn mice from Ciampino it was observed a MN increase (3.65 ± 2.27 and 0.83 ± 0.66 for exposed and control mice, respectively; $p < 0.0001$) even to a Radon exposure (260 kBq h/m3) lower than that recorded in Vetralla (1090 kBq h/m3). In the latter town mean MN frequencies were 2.34 ± 1.49 for intrauterine exposed mice and 1.25 ± 0.7 for controls ($p < 0.05$). These results could be linked to a higher sensitivity to Radon emissions of the neonatal phase with respect to the intrauterine phases. Further investigations on the mutagenic effects of Radon and its decay products on the gestational time and first neonatal periods should be carried out.

Keywords: Radon emissions, decay products, genotoxic damage, micronucleus test

Ultrafine Particles and Chemical Risk in Automobile Repair Shops

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The sector of the automobile repair shops (also known as garages), a repair shop where automobiles are repaired by auto mechanics and electricians, is characterized by a large number of small independently owned companies, however, share the same risk factors related to the building structures, technological systems and products used.

In the garage activity, it is necessary to undertake a detailed assessment of the health risks that includes the evaluation of workers due to the usage of dangerous products involved in the work procedures. Although this assessment may be performed by models or referring to literature data, the high job variability during the work shift makes it appropriate to carry out measurements at least in the initial phase or in cases of changes of the working cycle. For the measurement of chemical agents, it is necessary to use standardized methods or, in their absence, appropriate methods, with particular regards to occupational exposure limit values and to representative periods of the exposure in terms of spatial and temporal evolution. Regarding instead the ultrafine particles, in the absence of a precise legislation, it should be better to obtain information as possible in terms of the number and trend.

In the performance of work activities, the operator may be exposed to welding fumes during the phases of assembly (welding operation), and to sanding dust and solvents contained in the grouts during the preparation steps. Some products may contain hazardous substances to the human health: toluene and xylenes (solvents), isocyanates and styrene (fillers and primers), and pigments (possible presence of aromatic amines). The exposure degree depends on the mode of use, the amount used, the rate of use and personal protective equipment. The staff responsible perform interventions ranging from simple maintenance to repairs. In this communication the working procedures such as machines sanding and painting are deeply investigated. These processes result in a high chemical risk (Volatile Organic Compounds, VOCs) and production of ultrafine particle that can be harmful to exposed workers.

No significant critical situations have been evidenced either as weighted averages in turn as both short-term exposure, despite the fact that during the jobs some solvents (e.g., 1,2-dichloropropane) reach levels close to the STEL limit. For the airborne particulate matter (PM10, PM2.5, PM1 and respirable fraction) are observed values lower than the limit values. Further, the behavior of each fraction is shown and commented. Even if the indoor air quality in three garages investigated is not critical with regards to ultrafine particles and VOCs, the situation described above shows that the chemical risk in the garage sector cannot be considered negligible. In addition, it highlights the need to continuously monitor the particle component in relation to the worker exposure.

Keywords: Ultrafine particles, Exposure, Chemical risk, Indoor.

Modeling the dispersion of pollutants from point sources with a microscale and a mesoscale model during an episode case in a complex terrain area in Greece

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Modeling and its applicability in environmental situations, is considered to be a tool that is developed and applied from scientists and researchers in order to simulate real cases. More specifically, simulations such as area, line and point sources, as well as extreme meteorological conditions of cyclones, dynes and inversions are of high interest in the research community. Moreover, modeling is related to impact assessment studies to represent phenomena from a micro scale to a high scale. In this work, a simulation from three stacks of a power plant factory during an inversion episode is attempted. For this simulation a micro scale computational fluid dynamics model (ANSYS-CFX) and a meso scale prognostic meteorological and air pollution model (TAPM-GUI) were used, configured and run for 2 days. An ANSYS-CFX model configuration including the industrial sources (three stacks emissions) has been built, in order to predict the air pollution smog dispersion in time and space, in a cubic domain of 500 m for each direction. The Model was configured for the region of interest, by extracting the initial and boundary conditions, which are provided from the measurement stations in the same area. TAPM was covered the area of approximately 30x30 km2 to the inner grid of the simulation with data assimilation from 10 stations for meteorology, and for pollution in the same domain 13.5x13.5 km2.

Keywords: Dispersion modeling, TAPM, ANSYS-CFX, point sources, complex terrain

Annual Carbon Footprint Estimation of a Ship and the Comparison of the Emission Amounts with Different Transportation Modes

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Shipping has great impacts on economy and environment issues. For they can carry big amount of goods, they are used commonly by the countries and companies. Besides, shipping have an important place in military and entertainment issues.

On the other hand, shipping emissions have a great impact on human health and environment. Shipping emissions can be divided into two main sub-group: Emissions to air, emissions to water. Emissions to air includes carbon dioxide (CO_2), carbon monoxide (CO), oxides of nitrogen (NOx), oxides of sulfur (SOx), black carbon (BC) and particulate matter (PM). For the fossil fuels' main compound is carbon, carbon-based emissions are inevitable end-products after combustion. SOx is mainly depends on fuel content and NOx forms due to the air used during combustion process. PM is formed as a result of poor combustion. These gas-formed emissions are easy-to-inhale and thus, have dangerous effects on human health. They also causes the greenhouse effect and other types of harmful impacts to environment, such as acid rain etc. In order to monitor and control, the amounts of emissions must be well known and documented. Thus, some different estimation methods have been developed to calculate the emissions worldwide and local. Intermodal freight transportation is a method of freight transport using multiple modes of transportation (rail, ship and truck) without any handling of the freight when changing modes. Due to the reduction of handling, damages and losses reduce and the security of goods improves. Intermodal transportation mode can also an effect on reducing the emissions.

In this paper, it is aimed to calculate annual carbon footprint of a ship by different methods by using the real data. The same route is used to calculate the emissions amounts emitted by intermodal transportation mode. A comparison is made between shipping and intermodal transportation.

Keywords: Intermodal transportation, Annual Carbon Footprint, Emission Amounts

Energy Efficiency Operational Indicator (EEOI) Calculation of Some Ships and a Life Cycle Assessment (LCA) Model to Reduce the Environmental Impacts

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Shipping has been one of the oldest and most complex industrial sector in the world. With manufacturing, operation, maintenance/repairing and dismantle/recycling processes, it has a great effect on economy, environment and many different kinds of issues.

During all of the shipping processes a considerable amount of recyclable and unrecyclable by and end products are formed. Particularly operation phase –for it is the longest-termed phase- is responsible for most of the harmful emissions caused by shipping. Thus, there are many scientific studies on reducing operational impacts to environment and human health.

International Maritime Organization (IMO) is indicated as the main authority on shipping emissions by Intergovernmental Panel on Climate Change (IPCC). IMO formed Marine Environment Protection Committee (MEPC) in order to make necessary and comprehensive studies on this issue. Energy Efficiency Operational Indicator (EEOI) is developed for indicating and comparing the environmental performance of the ships in operation phase. EEOI indicates a number of ships' environmental performance based on ships' some technical details.

Life Cycle Assessment (LCA) is a comprehensive and holistic method aims to reduce all of the harmful emissions of a product during its life cycle. A ship's life cycle involve manufacturing, operation, maintenance/repairing and dismantle/recycling phases. For ships have relatively long-termed products, they produce big amounts of contaminants that are dangerous for environment and human health. LCA method is used to reduce these contaminants and energy used during the life-cycle. It also aims to increase the efficiency. In this paper, EEOI is used to calculate and compare some ships' environmental performance. It has been decided if it is needed to implement some new technologies according to the new regulations. A LCA method is developed and offered to reduce the harmful emissions.

Keywords: Intergovernmental Panel on Climate Change, Marine Environment Protection Committee, Energy Efficiency Operational Indicator, Life Cycle Assessment

Examining Granger causality between atmospheric parameters and radon emissions

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Radon is an inert and radioactive soil gas, generated in the Earth crust, which moves upward toward the surface and diffuses into air.

Radon's properties have led to its use for geophysical purposes, as tracer for locating buried faults and geological structures, in exploring for uranium and for predicting earthquakes or volcanic eruptions. It is known that Rn emissions are affected by environmental parameters, such as temperature, relative humidity, elevation, air drafts.

However, it has to be elucidated how variation in these factors affects the exhalation process. One of the current problems is the assessment of the role of atmospheric parameters on radon emission, such as seasonal and daily changes in atmospheric factors.

In this paper, we show the relationship between atmospheric parameters (i.e., temperature and humidity) and radon data. We use the linear Granger causality in order to observe possible connections, on short and mid time scale periods, between radon time series and meteorological parameters that strongly influence radon emissions. The analysis suggests radon emission is not affected by these atmospheric parameters on short periods, while there is an evidence of Granger causality on mid periods.

The present paper describes the development of a new approach for continuous measurement of Rn emissions from the subsoil, based on gamma detection of its decay products. The new sensor devices are placed in a 7 cm-thick lead box, 3-4 meters underground surface, without air ventilation. Instruments measure the gamma radiation emitted from Radon daughters (214Pb and 214Bi) with energy of 351 and 609 KeV.

Keywords: Granger causality, Radon, emissions, atmospheric parameters

Experimental evaluation of the toxic potential of odor abating compounds released in confined environments

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The odor emissions from industrial or waste-treatment plants have made the control of malodors an important aspect of maintaining an acceptable level of air quality. The odor-control strategy has been more recently applied also to confined environments, such as commercial buildings, where large numbers of people congregate and indoor air pollution can be caused by occupants. The development of abatement systems to reduce odor emissions has been receiving increased attention over the last decades. At present, many odor-neutralizing products, which are commercially available, are consisting of multi-component mixtures where organic compounds with different types of action, such as odor masking, counteracting or neutralizing, are generally present. In spite of an increasing number of available products, still there is an important lack of information about chemical composition or mechanism involved in the odor neutralization.

Since in confined areas particular concern is linked to the possible development of microorganisms such as bacteria or algae within the air-diffusion system, growth stimulation or inhibition effects of the odor-abating (OA) agents should be investigated by ecotoxicological approaches. Further, since the indoor release of OA compounds should not be continuous, but controlled by automatic air pollution sensors, the toxic effects should be related to the OA release-times.

In this work the algal toxicity testing was used to evaluate the capacity of a commercial OA product to prevent any microbial development. An experimental strategy was developed to simulate the diffusion of OA volatile compounds in confined environments, aimed to measure their toxic potential with regard to their release time. Graduated OA-concentrations in the test solution were obtained by exposing the culture medium to the release of OA-small tablets, which were suspended in the head-space of closed test-flasks. A wide range of progressive release-times, starting from the very short 15 minutes up to 16 hours exposure to the OA compounds, was selected. The solutions, set-up in triplicate semi-closed test-flasks, were simultaneously inoculated with the test organism *Pseudokirchneriella subcapitata* and incubated under standard-controlled OECD conditions. The toxic effects were evaluated using the algal growth responses measured during 72h incubation. Significant effects of growth inhibition were measured in all the test solutions, even in the lowest test-concentration, which was obtained by an exposure as short as 15 minutes to the release of OA compounds. All the measured effects, ranging from 12 to 99% growth inhibition, were related with the OA release-time. Further, a supplementary effect of additional compounds, progressively dissolved into the test solutions, was observed after four hours diffusion.

As an economic gain, the high toxic potential towards the test microorganisms enables to avoid expensive treatments of germicide addition to the OA tested product. The ecotoxicological outcome further supports the effectiveness of the experimental strategy to predict the effect of the controlled emission of different OA agents in confined environments.

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Biodiversity and ecosystem functions

Identifying Land Use/Cover Change by Using Remotely Sensed Data: Istanbul Sarıyer Case Study

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Istanbul, which is among the 25 largest urban areas in the world, is the largest city inTurkey. Extending into both Europe and Asia, Istanbul keeps its attractiveness despite being the most crowded city in Turkey with a population of approximately 14 million. As it is also known as the most industrialized city of Turkey, many people migrated from rural areas to Istanbul starting from 1970s. Uncontrolled urbanization caused changes in land use especially in forested and agricultural areas in Istanbul.

In this study, Sarıyer, one of Istanbul's major districts, was selected as the study area. The district of Sariyer is located in the northern region of the Bosphorus on the European Side. The district has shores both to the Black Sea and the Bosphorus. The district has a larger forested area however, the number of these forest areas has decreased due to destruction from past to present. Other than the forests, there is a considerable number of residential and agricultural areas inside the district. Sarıyer is also important in terms of its population, population growth rate, historical, cultural and ecological features.

The aim of this study was to determine and evaluate the land use change by using satellite images. The research method was applied in two stages; classification and change detection. As the first stage of the study, the remote sensing data were processed. At this stage, LANDSAT TM + ETM satellite images dated 1987, 1997, 2005, and, 2010 were studied. Supervised classification and then accuracy assessment processes were applied to all the images, respectively. 50 spectral classes were formed for each image by means of unsupervised classification process. Maximum Likelihood Classification Method was used in supervised classification process. Afterwards, four information classes were determined based on the first level of CORINE database. These are artificial surfaces, forest and semi – natural areas, agricultural areas and water bodies.

After the classification process, accuracy assessment was applied to all images. With this operation, kappa statistical value and the overall accuracy were calculated. According to this assessment, the lowest accuracy with 86 % belongs to the image dated 1997, and the highest accuracy with 91 % belongs to the one dated 1987. It was seen that these values meet the expectations of 80 % accuracy. It was found appropriate to continue the study with these accuracy results.

Following the accuracy assessment operation, change detection process was applied for the years of 1987 – 2010, 1997 – 2010, 2005 – 2010 in order to determine the changes between the land use classes. At this stage, image matrices obtained by classification process were compared with each other. Matrix analysis produces a thematic layer that contains a separate class for every coincidence of classes in two layers. By using this method, not only land use change but also specifications and direction of change can be determined. As a result, it was determined that 23.24 % of forest and semi – natural areas and 51.72 % of agricultural areas were converted to artificial surfaces.

Keywords: Remote sensing, land use/cover change, Istanbul, Sarıyer

Determination of the Cultivated Agricultural Areas using Multitemporal Landsat TM Images

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Changes on the vegetation characteristics of the Earth's surface impact the albedo of the surface, the amount of water vapor and carbon dioxide in the air therefore resulting in influences on local and regional weather and climate. Monitoring of the seasonal vegetation changes is important to understand its effects on micro-climate and ecology of the region. Dense vegetation mostly indicates the productivity of the natural and agricultural areas while decrease in vegetation points out land degradation. More specifically, agricultural areas show a rapid change in crops phenologic growth stage that has direct impact to change in environment. Moreover, irrigation and fertilization activities during this period affects terrestrial biosphere in addition to crops own contribution to carbon cycle. Thus monitoring the vegetation progress in cultivated areas will contribute to understand and model the interactions between agriculture and environment. Satellite images are widely used for determination of the vegetation and its change over time with their capability of collecting spectral information from large areas in temporal basis. Multitemporal image acquisition enables differentiating different crop types and determining their spatial distribution even if they are cultivated in the same season considering the different phonological agenda of different crops.

This study focused on determining the cultivated areas at crop level in Aydin Province that is located in southwestern Turkey, in the transition of Aegean to Mediterranean climate, using multitemporal Landsat 5 TM images. Five images that were acquired between June –August period in 2011 will be used to identify cotton and maize planted areas of the province. Images obtained in different dates will aid the differentiation of different crop types within the region. Normalized Difference Vegetation Index (NDVI) and Principal Component Analysis (PCA) will be applied to images in order to reduce data dimension. Iterative Self Organizing (ISODATA), Maximum Likelihood (ML) and Support Vector (SVM) classification algorithms will be applied to multi-layer images derived from multitemporal NDVI and PCA images to find out the best algorithm for crop mapping of the research area. Accuracy assessment will be applied to classification results using random point sampling and areal comparison with Farmer Registration System (FRS) statistics.

Keywords: Cultivated area detection, crop type identification, multitemporal data analysis, remotely sensed images, image classification

Mapping the Distribution of Oil Sensitive Fish and Bird Species in the Istanbul Strait

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Istanbul Strait, Bosphorous, that is one of the sensitive and vulnerable areas in the world, combines a natural beauty, various human- use resources and a high number of oil carrying tankers passing through it. As evidenced by the previous accidents, a considerable increase in the number of marine vessels over the past decade is an indication of the high potential for oil spills. This situation poses a considerable threat on the Bosphorous ecosystem which is one of the most important migration routes of Mediterranean and Black Sea fish and of many continental bird species.

This study aims to map the ecosystem resources regarding possible oil spill threats from the oil spill response point of view. Spill response is regarded as an emergency as it is impossible to know when and how it will occur. Thus, emergency cases need to be forecasted and managed with caution for the sake of developing a better contingency planning. Environmental Sensitivity Index (ESI) is an index developed by USA National Oceanographic and Atmospheric Administration (USA-NOAA) which is used to analyze the vulnerability of coastal resources against oil spills. This index is comprised of integrating coastal classification, human-use resources and biological resources data to be used as a decision making and strategy development tool in oil spill response operations. With the help of ESI classification, fish and bird species encountered around Bosphorus for year-round were collected through a literature survey and are related to geographical locations. Ecosystem dataset contains name of the species, their abundance, time and location of presence. Afterwards, ecosystem data are compiled into a geodatabase where data on marine accidents were analyzed and risky areas regarding to marine accidents and possible oil spill locations are determined. With the analysis of the most probable accident locations through the Bosphorous, information is produced on a monthly basis on the potential risk that might affect the fish and bird species by exposure to oil spills. This study shows the importance of an ecosystem geodatabase and its usage regarding oil spill risk. By the integration of such an inventory into GIS, species to be considered during an emergency can be analyzed, specific protection measures based on the species can be defined beforehand, and this information can be utilized by the marine food auditors in order to inspect seafood sales or to mobilize NGOs working for the protection of oil-slicked organisms.

Keywords: Bird species, Bosphorous, ESI, fish species, geodatabase, oil spills

Analysis of Different Remote Sensing Vegetation Indices for Iğneada Longos Forest Mapping

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One of the most common applications of remotely sensed data is the extraction of land use/cover information for environmental studies such as forest inventory, natural disaster management, biodiversity, and water resource management. It is possible to provide economic, accurate, temporal, reliable and updated information from medium resolution satellite images for large geographic areas but mixed pixel problem needs to be considered. Several vegetation indices have been developed to solve the problems of land use/cover classification in the natural areas.

Igneada flooded forest, one of the important protected areas of Turkey, was selected as a study area. İgneada is located at the Black Sea coast in the northwest of Turkey that is 20 km away from Bulgarian border. The area houses different kinds of ecosystems and a wide range of biodiversity. Despite its ecological sensitivity and importance, İgneada has been under serious threats of the projects such as supplying drinking water project to Istanbul, a harbor project, and a coastal road project.

This study will be evaluate the use of Thematic Mapper (TM) band combinations and several derived vegetation indices to determine optimal vegetation indices and band combinations for discriminating flooded forest areas (longos) from mixed forest areas in Igneada, Turkey. 2010 dated 3 Landsat TM images will be used in the study from three different seasons (spring, summer and autumn). Intrinsic-based vegetation indices such as Normalized Difference Vegetation Index-(NDVI) and Ratio Vegetation Index (RVI) and soil line-based vegetation indices (Perpendicular Vegetation Index-PVI, Soil Adjusted Vegetation Index-SAVI and Modified Soil-Adjusted Vegetation Index (MSAVI) will be applied and the results will be compared by using training samples for each different selected tree species. One-way ANOVA method will be used with a post-hoc Scheffé test at each image based collected training samples for the individual class pair. ANOVA will be applied with two confidence levels: a 99% confidence level ($p < 0.01$), and a 95% confidence level ($p < 0.05$) to compare different vegetation indices.

Keywords: Remote Sensing indices, igneada, flooded forest

Comparison of wild and cultivated form of mountain tea (*Sideritis stricta*), regarding their ecological, anatomical, morfological and volatile oil properties

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It is important to cultivate medicinal and aromatic plants in order to protect them from harmfull collecting from the wild. The aim of the present study is to investigate the differences between wild and culture form of *Sideritis stricta* which is an endemic species, from Lamiaceae (Labiatae) family. It is of economical importance for Antalya, i.e. collected and marketed by the local people. Culture forms were collected from Aksu and the others collected from Kemer.

Our study were carried out in May, June and July months which were the period of species' flowering. Climatic features such as temperature, humidity and rain of the areas where plants were collected were determined. Soil samples were taken from the work areas and height measurements were made. In the context of physical and chemical analysis of soil samples, within the analysis, soil acidity, electrical conductivity, calcium carbonate, organic matter, total phosphorus, potassium, calcium and magnesium quantities were found. For nutrient analysis of plant organs, the amount of nitrogen, phosphorus, potassium, magnesium, calcium, manganese, iron, zinc, copper and boron quantities have been detected. Above ground parts of plants belonging to the morphological characteristics were measured and photographed, most of the anatomic sections, root, stem and leaf were photographed. Essential oil components of sample plants were subtracted with the method of hidrodistilasyon and determined by GC and GC-MS.

When we compare the results of the two samples there are some differences. Aksu receives more rainfall than Kemer therefore Aksu is moister. Results of the soil analysis indicated that the soil sample that cultivated plants were grown is alkaline, too much calcerous and phosphorus and potassium quantities are much more than that is in the soil sample from the natural environment of S. Stricta. The soil sample that wild plants grew is highly alkaline, moderately calcareous and calcium and magnesium quantities are much more than cultivation area's soil. The nutrient analysis of plant organs showed that amount of iron is much more in cultivated plants than wild ones. The main components of volatile oil which derived from the plant that cultivated form are; Caryophyllene %13.09, ß-pinene %11.10, δ- cadinene, %8.80, Abietatriene %7.32, Germacrene %6,50 ve α-pinene %5,25 and the main components of volatile oil of the nature plants are ß-pinene %27.33, Caryophyllene % 16.52, α-pinene %9.52, 13(16),14-labdien-8-ol % 6.85 and α-terpinene % 4.56. The other determined properties are similar for both of culture and wild form of the plants. To conclude, due to the environmental changes and different ecologic factors, wild and cultivated plants differ from each other.

Keywords: Ecology, climate, morfology, anatomy, volatile oil, Antalya, *Sideritis stricta*

Genetic characterization of honey bee (*Apis mellifera*) populations in Algéria

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Beekeeping in Algeria is not developed and practiced in a traditional manner. In recent years through, the development plan that agricultural subsidies are given loans of sum of money to beekeepers encourage them to invest in this business. So beekeeping business began to grow in many parts of the country. El Tarf in the East, Blida in the center, Mostaganem in the West and Ghardaïa in the South. Some beekeepers have started importing queens in order to increase honey production without worrying about the problem of genetic introgression.

In the present investigation, honey bee populations from various areas of Algeria were studied using analysis of the mitochondrial DNA molecule, especially the region between the tRNAleu and COII genes that contains a non-coding sequence with two sequence elements: P, showing several forms (P, P0) and Q.

A total of 618 colonies were sampled from 31 localites in Algeria according to the transects East-West and North-South, during the years 2000 -2010; these locations are grouped together in 8 populations according to their nearness.

The results show that most Algerian samples belonged to the mitochondrial A lineage (A1, A8, A9, A13, A10 and A2) but a small proportion of samples displayed restriction patterns typical for the mitochondrial M and C lineages.

Keywords: *Apis mellifera* / mtDNA /Genetic diversity / Algeria

Microbiological indicators to evaluate ecosystem soil quality and its changes in diversity and functioning

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Soil quality represents an integral value of the compositional structures and natural functions of soil in relation to soil use and environmental conditions on site. Among the main soil components, different organisms and in particular microorganisms play a key role in ecologically biogeochemical processes. In this way, soil microorganisms contribute to the maintenance of the matter and energy transfer in terrestrial environments. Under anthropogenic stress conditions such as intensive agriculture and diffusion of pollutants, biochemical activities of soil microorganisms can be differently affected. Several microbiologically-related parameters contribute to provide an ecological evaluation of soil state therefore, they can be considered as indicators of soil quality.

In this regard, we report some preliminary results of a Research Project dealing with three sites, located close to Taranto City, in the South of Apulia Region (Italy), affected by land degradation processes such as soil organic matter decline and/or organic (PCB) and inorganic contamination. Soil samples were collected and both chemical and microbial analyses were performed in order to evaluate the quality of the soils and to compare the three sites.

For this purpose, the main physico-chemical soil characteristics (organic carbon, available phosphorous, total nitrogen, carbonate and water content, texture and pH) were determined. Moreover, some samples have been analysed by GC-MS and ICP-MS in order to identify organic (PCB) and inorganic (e.g. Pb, Se, Sn, Zn) contaminants, respectively. Finally, the structure and functioning of the bacterial community was studied by evaluating the bacterial abundance (DAPI counts), the cell viability (Live/Dead method), the dehydrogenase activity (DHA), and the Microbial Community Composition by Fluorescence In Situ Hybridization (FISH). The overall results showed that the bacterial structure and functioning were affected in different way by the organic carbon availability and contaminant occurrence (organic or inorganic compounds), showing how land degradation processes can affect ecosystem soil biodiversity and functioning.

Keywords: soil quality, microbiological indicators, ecosystem soil biodiversity and functioning

Tintinnid (Protozoa: Ciliophora) Species in the Gulf of Gemlik and Some Ecological Properties of the Environment

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In order to determine the tintinnid species and abundance in the Gulf of Gemlik and some ecological variables that affect the distribution of the species, samples were collected with a Ruttner bottle and a plankton net (40 µm) at 11 stations (6 shore, 5 offshore) between June 2010-May 2011 monthly. From the examination of the samples, 27 tintinnid species belonging to 7 familia, 12 genus were identified. According to literature information, 18 species were new records for the Sea of Marmara, and also 4 of them were new records for Turkish coastal waters (Eutintinnus medius (Kofoid & Campbell) Kofoid & Campbell, 1939, Metacylis mediterranea (Mereschkowsky) Jörgensen, 1924, Tintinnopsis acuminata Daday, 1887 and Tintinnopsis urnula Meunier, 1910). The majority of the species composition was represented with Codonellidae and Tintinnidae families (both of 8 species, 28.6%). The genus Tintinnopsis were observed as dominant when compare with the others according to numbers of individuals. The maximum number of individuals of Tintinnopsis was recorded in October 2010 (10520 ind l-1). Primary hydrographic conditions, temperature (8.1-29.3 °C), salinity (14.98-38.65 ‰), dissolved oxygen (2.06-17.18 mg l-1), and pH (7.7-8.8) were recorded maximum and minimum values on each sampling stations.

Keywords: Sea of Marmara, Gulf of Gemlik, Tintinnids, Abundance, Planktonic ciliates

Changes in phytoplankton community structure in the Gulf of Bandırma, Marmara Sea in 2006-2008

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Phytoplankton composition and some ecological variables were investigated seasonally between November 2006 and August 2008 in the Gulf of Bandırma. From the analysis of phytoplankton community composition, 99 species of 5 different algal groups were identified: 56 dinoflagellates (56.6%), 38 diatoms (38.4%), 3 dictyochophyceans (3%), 1 euglenophycean (1%) and 1 prasinophycean (1%). Diatoms and dinoflagellates were the most dominant groups in term of species number at 3 sampling stations. Regarding species number, the genus Protoperidinium, with 13 species, was the most important, followed by Ceratium and Prorocentrum (7 species). In addition, the highest species number was obtained from the surface at station 1. The maximum total phytoplankton abundance (640×10^3 cells L-1) was observed in the surface water of station 2 in August 2008, with Cerataulina pelagica being the most dominant species of that month (600×10^3 cells L-1). In the Gulf of Bandırma, 22 identified taxa could have potentially led to harmful effects (e.g., toxic, fish-killing, or bloom forming); however, none of them except Cerataulina pelagica reached a level high enough to cause a negative effect.

Keywords: Phytoplankton, diversity, abundance, Marmara Sea

Effects of Environmental pollution on morphological, nutritional traits and photosynthetic performances of olive (*Olea europaea* L.) and Fig (*Ficus carica* L.) trees

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The Sfax region has recognized a pretty striking pollution due to several mainly industrial activities. Industrial Society of Phosphoric Acid and Fertilizers (SIAPE) currently represents the main pollutant source in this region.

Our study focused on the responses of the olive and fig trees to fluoride pollution rejected by these plants. Data acquired from the morphological analysis of polluted leaves compared to those controls within a control area helped to highlight the apical and marginal leaf necrosis in the olive tree. On the other hand, we noticed the presence of very fine edging that separates the healthy part of the necrotic and the presence of a film of white dust on the leaves exposed to toxic gas difficult to remove even after washing. In regards to the fig leaf, we noticed the appearance of necrosis on the ends of the polluted leaves. The characterization of the mineral status of the leaves of these two species have confirmed the important role played by the interactions of some divalent cations such as Ca^{2+} and the Mg^{2+} with fluorine and per consequent its trapping and detoxification. However, interaction of the type F^- - Mg^{2+} could be at the origin of some physiological disturbances. Similarly, the increase in phosphorus concentration seems to constitute a strategy adopted by these species to survive in the polluted area. The analysis of the photosynthetic performances of both species studied, under these pollution conditions, showed a wide reduction of net photosynthesis, stomatal conductance as well as the transpiration rates if compared to the plants from the control site. From these results, the olive tree displayed a higher resistance capacity to the pollution affecting the experimental area than the fig tree.

Keywords: Atmospheric pollution, mineral nutrition, photosynthetic activity, olive tree, fig tree.

The Seasonal Changes of Zooplankton in Gulf of Erdek, Marmara Sea

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This study was carried out in the Gulf of Erdek between November 2006 and August 2008. Zooplankton composition and some ecological variables were investigated seasonally at 3 sampling stations. During the study, 12 Copepoda, 3 Cladocera, 1 species from phylum Ctenophora; 1 species from phylum Cnidaria; 2 holoplankton groups and 7 meroplankton groups were recorded. Acartia clausi (401 ind/m3 in May 2008), Paracalanus parvus 139 ind/m3 in February 2007) belong to Copepoda, Penilia avirostris (610 ind/m3 in August 2008) belong to Cladocera and Liriope tetraphylla (270 ind/m3 in August 2007) belong to Cnidaria were important species in this study.

Keywords: Zooplankton, abundance, Marmara Sea, Gulf of Erdek

Temporal impact of urbanization on the protection zones of two drinking water reservoirs in İstanbul

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This study aims to examine the temporal impact of rapid urban growth on the protection zones (absolute, short-range, medium range and long-range protection zones) of the two selected drinking water reservoirs in the mega city of Istanbul between the years of 1987-2011. Spatial distribution of land-use and corresponding changes that occurred throughout the protection zones were analyzed via LANDSAT 5 TM images belonging to 1987 and 2011. Currently, Istanbul is ranked among the most crowded cities of the world with an approximate current population of 14 million. It hosts 18.3% of the overall population of the country. Urbanization and industrialization in addition to immigration from the other regions of Turkey for benefitting from better employment opportunities within years are the main causes of the rapid population increase especially within the past few decades. The two drinking water reservoirs selected for this study are Ömerli with a drainage area of 1612 km2 located on the Asian side of the city that supplies almost 27% and of the water demand of this mega city whereas the other is Büyükçekmece that situated on the European side of the city supplying 17% of the overall water demand with a drainage area of 632 km2. The land-use distribution profiles fo both of the examined years are based on V-I-S components model that considers 3 classes; vegetation-V- (forest, green areas, parks, etc.), impervious surface –I- (settlements and transportation) and soil –S-. The areal analyses were conducted using V-I-S component model for the examined years. The model describes the biophysical composition of an urban area as a function of these 3 components. As such, it provides a means of assessing the trend and relative magnitude of land cover/use change in an urban area.

At the end of the study, significant information is obtained on urbanization effects on the different protection zones of the two reservoirs by utilizing the V-I-S model. In general, it can be stated that the movement of the vector is towards the impervious land. It is also observed that in particular impervious land showed an increase while the vegetation cover and soil surfaces decreased. This model can easily be used for providing information on urban morphology by utilizing comparatively less components and for gaining better data on the magnitude and direction of urbanization.

The technical details of the analyses conducted in each of the protection zones will be presented in detail in the full manuscript. The current regional legislation on the protection and management of Istanbul's drinking water reservoirs state the allowable and restricted human activities in the various protection zones of each watershed. It also dictates the allowed maximum population densities in the protection zones. For example, the regulation allows no permanent settlements or industrial activities in the absolute and short-range zones. Thus, the results of the quantitative analyses that enabled the calculation of the spatial changes in the selected areas will also be discussed according to the current legislation on the protection of the watersheds.

Keywords: Drinking water reservoir, Istanbul, remotely sensed images, VIS model, urbanization, temporal land-use change, protection zones.

Assessment of thyme reduction using multitemporal satellite sensor data and in-situ spectroradiometric measurement: Altıoluk plateau,Izmit-Turkey

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The stockbreeding activities and the presence of endemic species of plants in nature are in interaction with each other continuously. Altıoluk Plateau/Turkey, which is an unspoiled area, hosts different flora species. One of the most important floras is "Thymus longicaulis C. Presl. longicaulis var. subisophyllus" is very important for region. The plateau's thyme flora are able to flower from spring to autumn is under the interest of visitors. Thyme contains essential oil has antibacterial and antifungal properties. Tea of thyme has antioxidant properties. Thyme, which increases the antimicrobial, antibacterial, anti-oxidative and aromatic properties of honey, is a quality nectar source for bees and herb for dairy cattle and also thyme is a natural beekeeper. Thyme presence of Altıoluk Plateau is under threat of ferns depends on the decrease in animal presences. Ferns are harmful for animal health. Ferns continuously oppressed and broken by the animals does not occupy to the plateau. Also, shepherds cut ferns for the obstruction of spore production of ferns. In this study, the relation between thyme and animal presences of were investigated using in-situ spectroradiometric measurements and multispectral satellite images. In 24.09.2012, spectroradiometric measurements were performed to generate the spectral data of different species-types such as thyme, fern, grass, bare land et al. 18.09.1987, 27.09.1999, 22.09.2003, 20.09.2011 dated Landsat 5TM and 14.09.2012 dated Landsat 7ETM satellite images and in-situ measured spectral data are examined together to demonstrate the multi-temporal variations of thyme areas by using spectral angle mapper classification method. The correlation of determinations between multi-temporal remote sensing area results and corresponding dated statistical data of ovine-bovine animals, horses and bees amount acquired from local government were found to be 0.96, 0.64, 0.90 and 0.75 respectively. The results of the study demonstrate that the thyme, fern and animal presences are in interaction with each other.

Keywords: Satellite sensor data, altioluk plateau, thyme reduction, İzmit

Grapewine varieties distribution in the cultivation area of Rahovec, Kosovo and their impact on different environmental parameters

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The area of Rahovec, Kosovo, is among the best known for the cultivation of grapewines. The cultivation of grapes dates since II BC, however, the area is converted in a highly productive one during the last century. Nowadays, in Kosovo the surface of wineyards is about 3217 ha, distributed into 7431 private farms. The number of farmers envolved in the management of the farms is 4965. The cadastral system of wineyards has over 40 registered varieties, from which 15 used as fresh fruits and over 25 for winery products. In Rahovec, one of the most important areas of Kosovo regarding the cultivation of grapes, the cultivated surface is 2242 ha, divided into 4828 farms belonging to 2699 farmers.

The intensive agriculture of the last century has influenced the improvement of many agrobiological characteristics of the cultivars themselves, as well as a number of environmental parameters related to the pedology, microclimate conditions and furthermore has had impact on the economical development of the area. Here we represent a number of data related to the categories of the cultivars of, the ampelographic data, and a detailed description of the environmental factors closely linked to agrobiological parameters influencing the cultivation of each variety, as, pedology and climate conditions through the years.

Keywords: Grapewine cultivars, ampelography, environmental conditions

Seasonal comparative study of macrozoobenthos of the rocky areas of the Adriatic Sea in Albania

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This paper represents a seasonal comparison of the characteristics of macrozoobenthic populations of the shallow rocky areas of the Adriatic Sea in Albania. Sampling has been carried out in four areas (Shen Pjeter, Kallm, Spille, Triport) in April and August 2011. Standard replicated quantitative samples have been taken in the supralittoral and mediolittoral by using a reticulated frame. A seasonal difference in the total species number has been recorded, where 106 species of benthic macroinvertebrates were found in April and 140 species were found in August. In both seasons the highest species richness has been recorded for gastropods, bivalves and crustaceans, where gastropods have an evident predominance in species number. The highest species number has been found in Kallm and in Triport respectively in April and August, while the lowest species number was recorded in Spille in both seasons. In all sites patellids and trochids had the highest abundance. Potential factors influencing the species presence and quantitative characteristics of macrozoobenthic populations have been analyzed taking into account the exposal of the coast, presence of macrovegetation and the human impact.

Keywords: Macrozoobenthos, Adriatic Sea, Albania

Data on macrozoobenthos of rocky coast of Nimfa, Vlora Bay, Albania

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Macrozoobenthos of shallow rocky coast of Nimfa area (south-eastern part of Vlora Bay, Albania) has been studied, focusing on the supralittoral, mediolittoral and upper limit of the infralittoral during 2006 – 2008. Replicated quantitative samples have been taken in April and October each year, by using a reticulated frame as a standard sampling area unit. This study gives data on species composition of macrozoobenthos and a general assessment of quantitative characteristics, seasonal variations and stability of zoobenthic populations in the studied area. A total of 75 taxa has been recorded, with a high dominance of mollusks, besides other species of crustaceans, annelids, echinoderms, and cnidarians. It is worthy to note the presence of 18 endangered species in national scale and 2 endangered species in regional scale (Lithophaga lithophaga and Paracentrotus lividus). Seasonal variations were high, with a higher number of species and higher abundance in autumn season. 49 species have been found in spring and 55 in autumn. The highest abundance has been recorded for Patella caerulea, Gibbula divaricat, Monodonta articulatus and Chthamalus depressus in spring season, while for Gibbula divaricata, Monodonta articulatus, Bittium reticulatum and Columbella rustica in autumn season. The gastropods Gibbula divaricata, Columbella rustica and Monodonta articulatus had a high abundance in both seasons. For the same species it has been recorded the highest seasonal variations in the abundance. Algal coverage seems to play an important role for the species composition and abundance of zoobenthos in Nimfa coast. Stability of zoobenthic community was low and this situation may be related to the high human impact in the recent years and degradation of macrovegetation cover (algae and seagrass) at the coast. The presence of species of national and regional concern highlights the importance of the studied area and the whole Vlora Bay in the aspects of biodiversity and environmental conservation and management.

Keywords: Macrozoobenthos, rocky coast, Vlora Bay, Albania.

The repetitive DNA of Bryophytes, a new, different and earlier kind of bioindicator

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Thanks to the particular type of absorption of water and substances dissolved in it, the Bryophytes have always been considered excellent bioindicators of environmental conditions.

At the same time, we now know that the highly repetitive /non-coding DNA, which once was considered useless for the life of the organism, to the point of being called "Junk DNA" or "Selfish DNA", it is vice versa important for the adaptation to the environment of the organism. In fact, the researches of the last years showed that the external stimuli, such as temperature variations, pollutants, or even mechanical stimuli or viral infections, induce quantitative changes just in this peculiar fraction of the genome. It is not about DNA modifications "harmfuls", but rather about a sort of "language" that the genome uses to respond to environmental stimuli: in fact the modifications of the non coding DNA, in turn, lead, via a "conformational" effect, to changes of the higher structures of the double helix of DNA, thus influencing, albeit indirectly, the transcription of the DNA encoding, like a real orchestra conductor.

The experimental data obtained for several years by our group in various species of Bryophytes, both by cytochemical analysis of DNA made directly within the cell, either through appropriate characterizations of the extracted DNA (Tm, Cot, etc.), have shown that, differently to what happens for the other vascular plants, the Bryophytes have a peculiar nuclear structure that allows fast, accurate and inexpensive observations of the qualitative and quantitative changes that occur in the repetitive fraction of the DNA. The purpose of the present paper is therefore to demonstrate that the Bryophytes can be used as a new, different and earlier kind of bioindicators. This would be a breakthrough in the field of biological indicators, also because, being the modulation of repetitive non-coding DNA one of the first responses of the organism to environmental stress, a response only "preparatory" to the other biological events, the use of such DNA as bioindicator could detect a potential risk of pollution also in those cases in which the natural defence of the plant makes ineffective other kind of bio-indicators.

Keywords: Earlier environmental bioindicators, Repetitive/non coding DNA, Bryophytes

Growth stimulating effects of blue LEDs on indoor cultivation of marine and freshwater green algae

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Microalgae are increasingly involved in several commercial applications such as in nutraceuticals and pharmaceuticals and have emerging potential in bioenergy production. Since the impacts of climate change are becoming more serious threats to agriculture, indoor cultivation, which could eliminate weather-related crop failures, is currently receiving particular attention. Compared to open pond cultivation, photobioreactors (PBRs) with proper lighting are ensuring indoor year-round production of microalgae biomass. Light-Emitting Diodes (LEDs), which are characterized by low power consumption and narrow-band wavelengths, are reported as the optimal light source for PBRs. Particularly, the use of flashing LEDs, providing microsecond-pulse modulation, yields a major gain in energy economy in comparison to luminescent light sources. Since only a fraction of the light spectrum can be trapped by species-specific pigments and used for photosynthesis, the excess energy present in the extra-photons, such as green and yellow bands, is almost wasted as heat. The selection of a specific wavelength range, suitable for the algal species which are cultivated, is thus particularly important to improve the efficiency by lowering the energy losses of the production system. Although two absorption bands, the blue as well as the red, are present in the spectrum of green algae, the use of red light is generally encouraged, while the role of blue light in regulation of photosynthesis and cell growth is still matter of disagreement.

With the aim to define specific wavelength bands fitting with the photosynthetic requirements of marine and freshwater species of green algae, mono and multi-chromatic flashing LEDs were used in a laboratory-culture system.

Exponentially growing cells of Dunaliella tertiolecta and Pseudokirchneriella subcapitata were exposed to different light treatments. While the white-light spectrum was used as a control, the chromatic bands tested included the red light, at 625, 660 or 680 nm, and the blue light at 460 nm. Using a multi-channel particle counter, the algal growth was measured as both number and cell volume, enabling to evaluate biomass yields. The single or combined red bands, as sole light source, successfully supported the growth of the two species, both showing similar or even higher productivity compared to the white-light control. Supplementing 680-nm red with 460-nm blue light, however, resulted in a significant increase of productivity, as high as to double the cell growth-rate of both species, the 72 hours biomass-yield under blue light addition exceeding by 4-fold those under red light solely. Based on the observed enhancement of productivity, the results definitely support an essential role of the blue band, as additional light source, in regulation of cell growth. The outcome of our experimental system can help improving the efficiency in biomass production of LED-based PBRs for indoor cultivation of marine and freshwater green algae.

Keywords: Microalgae, growth stimulating, blue LEDs, indoor cultivation

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Ecological disasters

Cs-137 contamination in wild boars in Sesia Valley, Italy

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Traces of cesium-137, well above the threshold set out in the Italian regulations, have been found in wild boars in the alpine area of the Sesia Valley, Piedmont, Italy.

We analyzed samples of tongue and diaphragm of animals slaughtered during the hunting season 2012-2013 and in 27 of these the level of cesium was higher than the threshold specified by the Italian Regulation 733 of 2008, dealing with the tolerable limit in the event of a nuclear accident. In fact, 27 samples have values above 600 Bq/kg, reaching up to 5600 Bq / kg in one sample, i.e., about ten times the limit. Cesium-137 is a radioactive isotope released, in 1986 from the Chernobyl disaster. It would seem that the contamination of these boars is so high due to the Chernobyl fallout and not, as it was thought at first, due to a radioactive medical source abandoned and disposed of illegally.

According to ARPA Piemonte (Governmental Regional Agency), the fall-out from Chernobyl was particularly high in certain areas of Piedmont, including the Sesia Valley, and it is not uncommon to find wild boars so contaminated and, in particular, this has already happened in other areas heavily contaminated by Chernobyl fallout as the Sesia Valley was.

A radiological test has been carried out, to assess conclusively that cesium-137 in the boars is "old Cesium" from Chernobyl and nothing something coming from a new contamination. Cs-137 (which has a half-life of 30 years) came from Chernobyl mixed with the shortest-lived isotope Cs-134 (which has half-life of about 2 years). In particular, in May 1986, the ratio of the radioactivity of Cs-137 versus Cs-134 present in the cloud and deposited on Italian soil was equal to about two (1.94): in other words, the radioactivity from Cs- 134 was approximately half that from Cs-137.

But the radioactivity from Cs-134 is halved every two years, while the longest Cs-137 halves every 30 years. So now, 27 years after Chernobyl, the radioactive concentration from Cs-134 has halved more than 13 times, falling to very little, while that of Cs-137 is still a bit 'more than a half of the original one. So, if we analyze the Chernobyl Radioactive cesium today, the ratio of the radioactivity of Cs-137 and Cs-134 is no longer near 2, but it has become, in favor of Cs-137, about 8900.

A further analysis has been performed with more precise measurements: the radioactive contamination of our boars shows a radioactivity of Cs-134 in their flesh almost imperceptible, but in the order - in the maximum case of the 5600 Bq/kg contamination – of 0.6 Bq/kg. Then it is confirmed that it is due to the heritage of the Chernobyl cloud contamination.

However, the wild boars are "sentinel animals" for pollution conditions in the areas where they live, because they provide precise information about the status of the environment. Thus, a contamination of the animals should require investigation and analysis of the environmental, meteorological and hydrological pollution in the areas where they live.

Keywords: Cesium-137, chernobyl, radioactive contamination, wild boars

Calculation of Stream Water Velocity and Flood Risk using Numerical Model- A Case Study from Filyos River

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Filyos River is located on the western Black Sea Region of Turkey with a catchment area of approximately 13 300 km2. Part of the river that is 215 km in length lies along the southwest-to-northeast direction and the rest 120 km length is situated in a north-to-south direction. Filyos River frequently experiences flooding usually resulting in loss of lives. In this study, stream sediment movements that may cause flooding were determined using numerical model and available data. The lowest and the highest stream streaming speeds were calculated to determine the flood risk area. For this purpose, the accumulation of sediments in some parts of the river was also calculated. Results of the numerical model indicated the average and maximum water velocities that lead to flooding. These results were then associated and verified with floods occurred in the region.

In the study, calculation of the water velocity by using numerical model is presented. MIKE 11 was used as the numerical model. It is a general river modeling system developed by DHI and it is widely used in Europe, Asia, and Australia. It is a commercial finite difference model based on the shallow water equations and was chosen to run one-dimensional analyses in this study. MIKE 11 hydrodynamic module (HD) uses an implicit, finite difference scheme for the computation of unsteady flows in rivers and estuaries. The module can describe subcritical as well as supercritical flow conditions through a numerical scheme that adapts according to the local flow conditions regarding time and space.

In the study, Remote Sensing and GIS techniques were used as tools to display land use/land cover classes. In the study; soil map and soil size derived by collecting samples from the sampling points were used as a separate data layer. The river network plain was divided into 4 streams (Filyos, Arac, Yenice, Devrek) with 235 cross sections using over 5,000 data points. The river network is entered into the model; the river is divided into branches, together with the cross-sections. The simulation period starts at 01/10/1999 at 12h and ends at 30/05/2000, using the data available. The time step was set to 1 minute. The downstream boundary condition defines the water level at the outfall, into the sea, constant at 0 m as the initial condition.

Keywords: Flood risk, numeric model, Filyos

Italian foundry contamination due to Cs-137

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In late October 2005 at the plant Beltrame in Susa Valley (Italy) a radioactive source was accidentally burned in the blast furnace. The source was not discovered by the detectors at the entrance, evidently because of some shielding effect.

This caused the contamination of foundry dust, air intake system, and of the filters. There was no dispersion in the environment and risks to workers.

All contaminated dust was collected in big bags and placed within containers waiting to know for their destination. The global activity is now estimated at 4 GBq.

In 2004, there was already a similar incident occurred in Vicenza, caused by an apparatus for gammagraphy: it is likely that the same has happened in this new incident.

Considering the fact that the estimated Cs-137 contamination is around 4 GBq, five different contamination scenarios, have been analyzed, i.e., possible ways by which such an amount of radioactive material could have been introduced into the foundry
.
The contamination scenarios A (Lost Radiotherapy Source), B (Lost Industrial Gammagraphy Source), and E (Contaminated material – Italian medium-level waste) have been analyzed and discarded. In conclusion, we consider as likely scenarios for the contamination source the ones as C and D in our list:
C – Lost gamma source for emoderivatives irradiation. Cs-137 sources are industrially used for irradiation of emoderivatives products for medical use. In this case, the source would have an activity compatible with the considered contamination (some GBq). The source would come inside a sealed shielding assembly, with a source capsule surrounded of a shielding materials such as lead.

D – Lost instrumentation calibration source. Cs-137 source are also used as calibration source for several instrumentation devices. Those sources are sealed and included into shielding assemblies too. Once the device is not operative anymore, the source may be thrown away with it and become an inadvertent contaminant inside a metallic waste. The considered contamination (4 GBq) is compatible with the total activity of some calibration sources

In both cases, Cs-137 is in the form of a quite small radioactive source capsule, sealed and surrounded by a shielding material assembly, such as Pb.

The source capsule would have a quite high radioactive concentration, and then a total mass in the order of grams. It has therefore to be classified – for sure – as a High Radioactivity Material, or, once it is inadvertently thrown away, as High Level Waste (HLW), according to the Italian regulation (III Categoria). The lead assembly shielding explains why the assembly passed through the check of the gamma sensor without creating alarm.

Keywords: Radioactive contamination, foundry, cesium-137, radioactive waste

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Ecotoxicity

Synergistic Chronic Ecotoxicological Impact (SCEI) of Emerging Endocrinic POPs Mixtures in WWTP Effluents, Surface and Ground Water The "Ecotoxicological connection": Water-Stressed Mediterranean Area Perspective

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Regardless of 'climate change', the population growth and the increasing scarcity of water in many regions of the world, arid and semi-arid, in particular, increased dramatically the water reuse, mainly of municipal wastewater treatment plants (WWTP) effluents [1]. Consequently, the pollutants, mainly the persistent organic endocrine disrupting chemicals (POPs-EDCs) which survive the various treatments – physical, biological, chemical and/or natural environment systems-based (e.g., bank filtration, SAT) – constitute an ever-increasing major environmental ecology- and health-related concern. This is due to the estrogenic-endocrine modulating effects of these POPs-EDCs, even in their surviving ng/L concentrations in the WWTP effluents which, ultimately, reach surface- and ground water resources. The main issue at point is not the LD of the separated EDC components in the WWTP effluents mixtures, but rather the actual combined chronic ecotoxicological impact of these endocrinic mixtures which, in turn, also point at a potential toxic health risk. Our longitudinal 'case study' research has been conducted in Israel, in which ~5.5x108 m3/y of sewage produced, ~70% are being reused, following conventional, or advanced activated sludge, or sand-aquifer treatment (SAT), mainly for agricultural irrigation. Following the determination of the concentrations/isomeric-homological profiles of (a) the actual EDCs-PAHs mixtures -- 34.0-35.0 and 0.23-0.25 μg/L of APEOs and PAHs in "representative" WWTP effluents – to be reused and; (b) the ecotoxicological impact of chronic exposure to real, environmentally relevant mixtures of EDCs; namely, 6.67-8.52, 6.75-12.24 and 29.28-40.28 of EE, E2 and E1 ng/L, respectively and/of EDCs-PAHs has been determined, using HPLC-GC/MS-based chemical analysis for (a) and the chronic ecotoxicological impact, by the IN VIVO zebrafish egg production test (ZFEPT) for (b) [2].The most important RESULT: A meaningful synergistic ecotoxicological impact of chronic exposure of zebrafish to persistent EDCs and EDCs-PAHs mixtures has been established in Israel's WWTP effluents [3].Selected experimental results, with respect to (a) and (b) (above), will be presented and their long-range implications critically discussed, in terms of the ecotoxicological and health risk potentials of WWTP effluents reuse, including the consequences of drinking of aquifer water contaminated by mixtures of the a.m. and other POPs-EDCs [4] and/or their ED metabolites/degradation products.

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Keywords: Ecotoxicological Impact, POPs, WWTP Effluents, water stress, Mediterranean region

Strategies underlying *Halimione portulacoides* (L.) Aellen tolerance to environmental mercury exposure - organ-specific antioxidant metabolism and polypeptide patterns significance

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This study investigates organ (root-leaf)-specific largely unexplored vital physiological/biochemical strategies adopted by salt marsh macrophyte Halimione portulacoides for its tolerance under environmental mercury (Hg)-exposure in Ria de Aveiro coastal lagoon (Portugal). To this end, a battery of damage- (H_2O_2; thiobarbituric acid reactive substances, TBARS; electrolyte leakage, EL; reactive carbonyls; osmolyte, proline) and defense- (ascorbate peroxidase, APX; catalase, CAT; glutathione peroxidase, GPX; glutathione sulfo-transferase, GST, glutathione reductase, GR, and reduced and oxidized glutathione (GSH; GSSG) and GSH/GSSG ratio) biomarkers, and polypeptide patterns were assessed in H. portulacoides roots and leaves at reference (R) and the sites with highest (L1), moderate (L2) and the lowest (L3) Hg-contamination. Corresponding to the Hg-burdens at different sites, roots and leaves exhibited differential damage and defense endpoints and polypeptide pattern-modulation. Root and leaf adopted differential osmotic-adjustment strategy by exhibiting increasing and decreasing proline level with increasing Hg-burden. Roots exhibiting the highest Hg-burden (at L3) failed to maintain coordination among enzymatic-defense endpoint responses which resulted into increased reduced glutathione (GSH) pool-oxidation but lowest GSH/GSSG (oxidized) ratio. Cumulatively, these responses yielded partial H_2O_2-metabolism and higher extent of damage. To the other, the highest Hg-burden exhibiting leaves (at L1) successfully maintained coordination among enzymatic-defense endpoints responses which resulted into decreased GSH-oxidation but enhanced reduced GSH pool and GSH/GSSG ratio, and subsequently to lower extent of damage. Increased leaf-carotenoids contents with increasing Hg-burden imply its protective function. H. portulacoides leaf-polypeptides did not respond as per its Hg-burden but the roots did. In conclusion - (a) the appearance of new polypeptides with differential intensity as well as the disappearance of polypeptides with different molecular weight in roots-leaves indicated their potential involvement in organ (root- and leaf)-damage and defense endpoints response-modulation which cumulatively confirm their significance in plant (H. portulacoides)-level responses to Hg-contamination; (b) H. portulacoides relied to a greater extent, on its root-specific adoption of tolerance strategies; though, the exhibition of Hg-burden dependent elevated damages in concurrence with parallel polypeptide patterns in roots is obvious when compared with leaf-specific coping strategies against Hg-stress.

Keywords: Salt marsh; Mercury; *Halimione portulacoides*; Antioxidant metabolism; Damage-defense endpoints; Polypeptide pattern

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MESAEP
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Cadmium and Lead Accumulation and Metallothionein overexpression in Tissues of *Venus verrucosa* Exposed to Contaminated Seawater

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Heavy metal pollution of coastal areas is a major problem with many consequences in both the environment and the life quality of the communities living in those areas. International regulations for the control of human/industrial activities related to heavy metal contamination of the environment and especially the coastal areas have been implemented the last few decades, whereas research on the improvement and expand of the pollution monitoring and remediation methods is continuous. Among others, several coast-living organisms have been employed as bioindicators of heavy metal contamination, with bivalves being the most popular among them. Bioindicators can give information on the pollution of their habitats not only by determining the heavy metal content in their tissues, but through the examination of the synthesis of defensive families of proteins such as metallothioneins or heat shock proteins. In this study we present data on the behaviour of Venus verrucosa, a sand-buried clam of the Mediterranean coastlines, in seawater contaminated with a wide range of Cd and Pb concentrations. Despite the commercial value of this species, such studies are scarce in the literature. A laboratory experiment was designed where the tolerance of V. verrucosa after the exposure to 0.5, 1.0, 2.5, and 20 ppm Cd or Pb for 20 days was measured. 10-days and 20-days depuration periods followed for the survived bivalves. Animals were collected after 0, 5, 10, 15, and 20 days of exposure and after 10 and 20 days of depuration, and gills, mantles, digestive systems and the remaining bodies were separated. Atomic absorption spectrometry was carried out for the determination of the Cd and Pb concentrations in each for the four tissues and for all the conditions studied. Zn and Fe concentrations were also measured with AAS in the tissue samples in order to see if the two essential metals were affected by the Cd or Pb accumulation in the warty venus. Protein content of the above mentioned tissue samples was determined by Coomasie-stained SDS-PAGE. New protein bands were identified and their origin was investigated. Quantitation of metallothionein levels induced by Cd or Pb was done spectrophotometrically at 412 nm in all tissues using Ellman's reaction. Fluorimetric analysis of the proteins was also carried out by labelling the –SH groups of the proteins with bromobimane which was converted from non fluorescent agent into fluorescent derivative so after electrophoresis the bands containing metallothioneins give fluorescent zones when exposed to UV light.

Keywords: Cadmium, Lead, *Venus verrucosa*, Metallothioneins, Bioaccumulation

Theoretical investigation of molecular properties of methyl-substituted anthracenes and biodegradation

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The process of obtaining accurate biodegradation rates experimentally may take several years. Taking into account that experiments on biodegradation can be a time consuming process, a representative calculation of biodegradation possibilities of PAHs is very attractive. It allows the assessment of biodegradation potential in much less time and predicts the condition of biotreatment. The group of bacterial enzymes responsible for the biodegradation of PAHs is aromatic hydrocarbon dioxygenase and they catalyze the oxidation of many aromatic compounds. Naphthalene 1,2-dioxygenase (NDO) is one of these enzyme systems.

Anthracene can be found among other PAHs in coal tar pitch and certain petroleum distillate fractions. The levels of anthracene and other PAHs in gasoline and diesel lubricating oils increase with mileage of use. Methylanthracenes have also been identified in diesel exhaust. Naphthalene dioxygenase is capable of degrading many PAHs but probably no PAHs with more than four rings [1,2]. Therefore, it is especially interesting to take into consideration two- and three-rings alkylated PAHs.

Previous studies on dimethylnaphthalenes (DMNs) [3] and trimethylnaphthalenes (TMNs) [4-6] showed that polarizability values can play an important role in the process of biodegradation by bacterial enzymes. The results of calculations of molecular properties of methylanthracene (MA) and selected dimethylanthracene (DMA) isomers have shown that the calculated ionization potential (IP) and electron affinity (EA) values are close for these isomers suggesting that oxidative and reductive pathways should not be critical for the biodegradation of these isomers. The increase of <α> values on passing from α-substututed to β-substituted isomers can play an important function in the biodegradative process of these isomers. Based on the calculated IP, EA, and α values of methylanthracene [7] and dimethylanthracene isomers, it may be anticipated that polarizability values are expected to make an important contribution to the different substrate-enzyme binding properties of these isomers in the process of biodegradation.

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Keywords: PAHs, theoretical modeling, biodegradations, methyl-substituted anthracenes

Contamination of irrigation water by cyanotoxins; Effects on Vicia faba-rhizobia symbiosis, and research of rhizobia tolerant to cyanotoxins to improve crop yield

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The global climate changes may contribute to the increasing eutrophication of aquatic ecosystems and particularly of lakes and reservoirs. As a result, cyanobacterial blooms become more frequent and ubiquitous in brackish and fresh waters. Cyanobacteria are ubiquitous in the environment and can easily contaminate drinking and irrigation water. In Morocco, as well as in many countries located in arid and semi-arid areas, irrigation with water from lake-reservoirs is a common agricultural practice, and an important tool for farmers to improve crop yields. Surface water bodies can contain potentially toxic bloom-forming cyanobacteria, and its use as a source for irrigation water can enable a transfer of cyanotoxins into crop plants (Saqrane and Oudra 2009). In Marrakech region "Lalla Takerkoust" is subject to frequent appearances of toxic Microcystis aeruginosa blooms (Oudra et al., 2002). The concentration of cyanotoxins (type microcystins: MC) in irrigation water coming from Lalla Takerkoust Lake can reach 100 µg/l MC-LR (Elghazali et al., 2011). The aim of this study is to evaluate the effect of cyanotoxins MC-LR on germination, growth and physiology of Vicia faba and to search the best symbioses rhizobia-faba bean under cyanotoxins exposure. Vicia faba is among the most food legumes grown in Tensift Marrakech El Haouz region. The results of HPLC-PDA obtained from the extract of the M. aeruginosa bloom, revealed a mixture of five variants of MC: DMC-LR; MC-(H4)-YR; MCLY; MC-FR and MC-LR. The MC concentrations tested on the rhizobial growth induced a significant decrease in the growth of RhOF6 and RhOF21, while RhOF4 showed toxin tolerance. The results showed that there was a negative effect of MC on plants shoot, root (dry weight) and total number of nodules per plant. Cyanotoxins exposure induced a significant effect on nitrogen assimilation by faba bean seedlings inoculated with selected rhizobial strains RhOF6 and RhOF21, while the effect was not significant on beans seedling inoculated with RhOF4. Exposure to MC-LR did not appear to inhibit the growth of Vicia faba plants, and none of the exposed plants exhibited chlorotic or necrotic tissue. However, roots exposed to MCs looked darker and thinner and exhibit a brownish aspect. The activities of PO, PPO and CAT enzymes were subsequently determined to predict oxidative stress promoted by cyanobacterial toxins. Enzyme activities increased significantly in leaves, roots and nodules of plants exposed to 100µg/l MC-LR. Nevertheless, for plant exposed to 50 µg/l the effect of cyanotoxins was not significant in many cases. All these investigations suggest that the plant chronic exposure to MC could have a repercussion on the life cycle of the plants. Cyanotoxins phytotoxicity strongly suggests a need for the surveillance of CyanoHAB and the monitoring of water irrigation quality as well as for drinking water.

Keywords: cyanotoxins, vicia faba, rhizobia, tolerance, MC-LR, irrigation water, contamination

Bioaccumulation and Depuration Modelling of Different Ring PAHs in *Mytilus galloprovincialis* and Application of Selected Biomarkers

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Polycyclic aromatic hydrocarbons (PAHs) are important organic pollutants in the aquatic environment due to their persistence and bioaccumulation potential both in organisms and in sediments. They are typically characterized by low water solubility and high octanol–water partitioning coefficients (Kow). They can be potent cell mutagens and carcinogens. They occur in the aquatic environment as the result of oil spills, ship traffic, pyrolytic processes, domestic and industrial wastewater discharges. They come into prominence because of their tendency to persist for years and bioaccumulation both in organisms and in sediments. With the entrance of organic pollutants such as PAHs into aquatic environments indigenous biota may be affected due to the accumulation of PAHs and their effects (Baumard et.al., 1998; Rust et.al., 2004). Bioaccumulation of pollutants may occur at each link in the aquatic food chains, starting from primary producers to humans consuming various aquatic organisms with their diet. Besides, toxic effects of PAHs are generally related to bioaccumulation in the organism, especially for filter-feeding organisms like mussels. In this study, bioaccumulation and depuration experiments were performed employing local Mediterranean mussel species, Mytilus galloprovincialis. The effects on the mussels were determined by two biomarkers: filtration rate and lysosomal stability (neutral red retention) assays. Mussels were selected as bioindicators due to their broad geographic distribution, immobility and low enzyme activity, which cause significant bioaccumulation of pollutants in their tissues (Pruell et.al., 1986). Benzo(a)anthracene (BaA) and phenanthrene (PHE) listed in EPA's priority pollutant list were chosen as the model PAH compounds due to the existence of BaA and PHE in several matrices in the marine environment. Bioaccumulation potentials of BaA and PHE were assessed by exposing local mussel species through both seawater and algae (Phaeodactylum tricornutum). Toxic effects of BaA and PHE in mussels were observed and concentration-response relationships were interpreted separately. Uptake and depuration behaviors of selected PAHs were apparent during the experimental period. Uptake and depuration rate constants, and bioaccumulation factors (BAFs) were calculated from the experiment results. Experimental QSAR values were found comparable to QSAR results based on logKow values in the literature. Furthermore, bioaccumulation and depuration of selected PAHs in Mytilus galloprovincialis were described using first order kinetic equations in a three compartment model. The model provides a mathematical description of bioaccumulation and depuration kinetics of selected PAHs in mussel species. In the model, the compartments were defined as: (1) biota (mussel), (2) surrounding environment (seawater), and (3) algae (Phaeodactylum tricornutum) as food source for the mussels. The biota compartment (mussel) accounts for PAH uptake via both seawater and PAH exposed algae during the bioaccumulation period. Thus, the model considers dynamic exchange of PAHs between algae and seawater. Developed model was evaluated with the data of bioaccumulation and depuration experiments. Experimental data were used to parametrise the proposed model for the selected PAHs. The model provided a good agreement between experimental data and simulation results for two different rings of PAH and three different concentrations.

Keywords: benzo(a)anthracene, phenanthrene, bioaccumulation, depuration, *Mytilus galloprovincialis*, mathematical modelling, biomarkers

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Assessment of genotoxic impact of fungicides on the population of mosquitofich *Gambusia affinis* using the micronucleus test

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Micronucleus assays with fish have showed to be useful in vivo techniques for genotoxicity testing, and illustrate a great potential for in situ monitoring of pesticides impact on freshwater fish as well as water quality. Over the last 30 years, there have been mass decline in freshwater fish populations and multiple causes were given. The environmental pollution as a main cause of this decline presents a great issue and is gaining attention. Freshwater fish are frequently exposed to agricultural pesticides known to be present on water surface.

The present work investigates the possible genotoxic effects of a stress agent; a systemic fungicide (widely used in the fight against parasites affecting cereals) on a model freshwater fish Gambusia affinis. This paper is focused on the study of certain physical and biometric parameters in artificial medium created in laboratory. The fungicide genotoxic potential was evaluated using genotoxicity MNT (micronucleus test). The fish were exposed to different fungicide concentrations (50, 75, 100,150ppm) and methyl methane sulfonate was used as a positive control at a concentration of 1,56mg/L.

The obtained results have showed a reduction of weight and size of Gambusia affinis subjected to a range of fungicide concentrations, as well as the index condition which reveals a delay of growth affecting the sexual maturation of the treated animals.

The toxic conditions results have illustrated high mitotic indices in erythrocytes and few cells with nuclear morphological aberrations such as binucleated cells. Concerning micronucleus frequencies, significant differences between positive control (MMS) and groups treated with fungicide concentrations were observed whatever the time of exposure. The results revealed genotoxic effects of fungicide on Gambusia affinis only at the highest concentrations (100 and 150ppm) and the longest time exposure (12days). Our results have demonstrated the suitability of the proposed test which can be used as an effective tool in environmental monitoring programs and risk assessment.

Keywords: Génotoxicity, Micronucleus test, Biomarker; Fungicides, Methyl Methane Sulfonate freshwater fish, *Gambusia affinis*.

Determination of LD50 and side effect of Spinosad in adult Algerian honey bees

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Bees are pollinators that occur naturally in agroecosystems and susceptible to pesticides used in these environments. Spinosad is an insect control agent derived by fermentation of the Actinomycete bacterium, Saccharopolyspora spinosa. This biopesticide is used on lawns, vegetables and fruit trees, to control caterpillars, thrips, leafminers, borers, fruit flies, spidermites, aphids, and more. Spinosad in known to affect honey bees through mortality and inhibition of physiological enzymes. Under laboratory conditions, honey bee workers were exposed via oral exposure in supplemented sugar syrup to different concentrations of spinosad. Lethal concentration that caused 50% mortality (LC_{50}) was estimated and the enzyme acetylcholinesterase (AChE) as biochemical indicator was determined after 24h in head, thorax and abdomen in bees surviving exposure to this biopesticide. Results indicated that exposure to spinosad showed toxicity to honey bees and spinosad significantly inhibited AChE activity in different organs of honey bee workers.

Keywords: Honey bees, toxicity, Spinosad, AChE

The molecular properties of trimethylnaphthalenes and prediction of their biodegradation rates

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Bioremediation has become one of the most rapidly developing techniques for cleaning up contaminated soil and aqueous environments and a number of bacterial species are known to degrade PAHs. However, the process of obtaining accurate biodegradation rates experimentally can be very time consuming. The calculation of biodegradation possibilities of PAHs is very attractive because it allows the assessment of biodegradation potential in much less time and predicts the condition of biotreatment.

The group of bacterial enzymes responsible for the biodegradation of PAHs is aromatic hydrocarbon dioxygenase and they catalyze the oxidation of many aromatic compounds. Naphthalene 1,2-dioxygenase (NDO) is one of these enzyme systems. Previous studies on alkylated PAHs indicate that the first order biomass-normalized rate coefficient of biodegradation significantly depends of the position of the alkyl substituents. The intermolecular interactions play important role for the binding affinity between the active site of the degrading enzyme and the molecule of PAH or alkylated PAH.

Following the findings of previous studies on DMNs, the averaged static dipole polarizability ($<\alpha>$) values of dimethylnaphthalenes (DMNs) can be used as a predictor of their biodegradation rates [1]. We performed a theoretical investigation of molecular properties of trimethylnaphthalenes (TMNs) using the ab initio and Density Functional Theory (DFT) methods. The results of the calculations show that the values of molecular properties important for defining the oxidative and reductive routes of TMNs vary little along the series of TMNs [2]. We investigated also the conformational deformability of the aromatic rings in TMNs. The results show that methylation in TMNs causes the increase of conformational deformability of the aromatic rings which can be important from the point of view of fitting of TMNs to the cavity of enzymes [3]. It is assumed that similar to DMNs, the rate-limiting step in the biodegradation kinetics of TMNs is expected to be determined by their polarizabilities. The results of the calculations show that the average static dipole polarizabilities of TMNs in gas phase as well as in water solution increase in the order α,α,α-TMN < α,α,β-TMN < α,β,β-TMN < β,β,β-TMN and they can be used as predictors of the biodegradation rates of TMNs [2]. This fact is particularly valuable since several years are required to obtain accurate experimental biodegradation rates.

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Keywords: PAHs, theoretical investigation, biodegradiation, TMNs

Pb and Cr assessment of sediment contamination in Boumerzoug wadi (N-E Algeria) and their transfer to subaquatic plant *Spinacia oleacera*

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Among the representative watercourses in north-east Algeria, the Rhumel wadi cross Constantine city and the Boumerzoug wadi is its main tributary. It is located upstream of Constantine. It drained a water catchment area of 1832 km2 and cross through built-up urban area. The aim of this study is the assessment of the contamination level of sedimentary compartment by lead and chromium in Boumerzoug wadi. The sediments were collected at 20 stations along the wadi at autumn, winter, spring and summer. Several physic and chemical parameters of water and sediments were measured and the trace metals (Pb, Cr) were determined in the fine fraction of sediment using aqua regia extraction and flame or electrothermal atomic absorption spectrophotometer. Also, we have sought to know the degree of transferred and bioaccumulated Pb and Cr in subaquatic chenopodiacea, Spinacia oleracea. This plant is marked and consumed by local population. The mean water pH was 7,54±0,3 and the electrical conductivity (EC) was 1700±1101 µS/cm. For the physic and chemical sediments parameters, the pH was slightly alkaline 7,77±0,3 (8,49-7,1); the EC 732±799µS/cm, was very variable (79 - 4420µS/cm); organic matter 10,95±3,65% is likely high (2,1-26,55%); CaCO3 is due to calcaro-marnus substratum 29,32±13,34% (0,76-66,66%). The fine sediment fraction, less than 50 µm, varied from 20% to 71%; the mean value was 43,55±12,87%. These fine fractions with organic matter are known to bound trace metals and the CaCO3 dilute the trace metals concentration. The Pb sediments concentrations varied from 10 to 440 µg/g and the mean value (N=80) was 64,6±63,8µg/g when the natural concentration is about 40 µg/g. The probable contamination starts at 100µg/g. The Cr sediments concentrations varied from 20 to 94µg/g and the mean value (N=80) was 50,77±15,91µg/g when the natural concentration is 30 µg/g and the probable biological effects are observed at 90µg/g. Spinacia o. grow on bed sediment and the related values concern only spring campaign in 16 stations were the plant was found (N=16). The roots Pb concentrations varied from 10 to 20 µg/g and the mean value was 13,75±5µg/g. The leaves Pb concentrations were similar, from 10 to 20µg/g with mean value was 13,12 ±4,7µg/g. The roots Cr concentrations varied from non detectable to 10 µg/g and the mean value was 3,62±2,55µg/g when the natural value for Pb Spinacia o. edible part concentrations is 2,36 µg/g. The leaves Cr concentrations varied from non detectable to 12 µg/g and the mean value was 2±2,8µg/g when the natural value for Cr *Spinacia o.* edible part concentrations is 0,5µg/g. Than the level contamination of *Spinacia o.* was higher than natural trace metals concentrations and it could occur some chronic disturbance to consumers.

Keywords: Wadi, Sediment, Contamination, Lead, Chromium, *Spinacia oleracea*

Mytilus galloprovincialis, Callista chione and *Venus verrucosa* Behavior in Seawater Heavily Polluted with Nickel

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Heavy metals, as environmental contaminants, are threats to the ecosystems' sustainability and potential dangers for humans and environment. Sentinel organisms have been used as biomonitoring species in a lot of monitoring programs such as UK's Clean Seas Environment Monitoring Programme or the Mediterranean MEDPOL, in order to investigate anthropogenically induced changes in metal concentrations in the marine environment, as well as the critical levels above which contamination may have serious effects on the ecosystem and the humans. So, evaluation of heavy metal concentrations in tissues of marine bivalves in conjunction with seawater pollution levels can provide a clear picture about the ecosystem status. Among the most approved biomarkers for monitoring trace metal contamination in marine environments are metallothioneins (MTs), low-molecular weight, cysteine-rich, heat-stable metal-binding proteins which play significant role in organisms' homeostasis and detoxification from heavy metals. The aim of this study was to examine three Mediterranean, filter feeding species, namely *Mytilus galloprovincialis, Callista chione* and *Venus verrucosa* for their potential as bioindicators for Ni pollution of seawater. *M. galloprovincialis* lives in the low intertidal zone of exposed rocky coasts with relatively high wave energy, or on the sandy-muddy bottoms of brackish lagoons, *C. chione* is found buried in the sand, offshore to at least 100m depth and *V. verrucosa* lives buried in the sand bottoms, up to a depth of about 30 m. We investigated the induction of MTs and the relationship to the accumulation of nickel in three different tissues (gills, mantle and the remaining body) of the bivalves, in laboratory experiments. Specimens of all three organisms were exposed to 0.5, 1.0, 2.5 and 20 ppm Ni for 20 days, and then a 10 days depuration period followed. Every 5 days, 30 organisms were dissected and the gills, mantle, and the remaining body were separated. Depurated bivalves (as well as non-exposed, control animals) were also dissected as described above. Mortality was not observed in any Ni-pollution level. Ni, Zn and Fe content in the tissue samples was measured by atomic absorption spectrometry after lyophilization and digestion in cHNO3. For quality assurance and quality control, standards and blanks were also digested and measured. Metallothionein determination was carried out spectrophotometrically by Ellman's method, and by electrophoresis. For electrophoresis, tissue extracts were treated either by urea-SDS or by bromobimane, a fluorescence producing agent in the presence of – SH groups. Coomasie and UV light were used for the visualization of the PA gels.

Our data indicate different behaviour of the three examined bivalves regarding both the accumulation of Ni and the synthesis of MTs. Similar differences were also observed between the three tissues of each species.

Keywords: *Mytilus galloprovincialis, Callista chione, Venus verrucosa*, Nickel, Bioaccumulation, Metallothioneins

Ecotoxicological evaluation of fire fighting foams

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The surfactants have become a common part of everyday human life. For their properties they are also used as additive components of foam extinguishers used in large quantities for area fires fighting. The aim of our study was to evaluate commercially available fire-fighting agents from the ecotoxicological point of view. Concentrates of foam extinguishing agents most often applied in cases of fires in the Czech Republic were obtained from Fire Rescue Unit as follows: Sthamex F-15, Expyrol F-15, Mousol APS F-15, Finiflam F-15 and Pyrocool B. In our experiments 3-5% solution in water as effective working concentrations of extinguishing agent were tested. Since surfactants have a negative impact mainly on aquatic ecosystem at first the ecotoxicity in aquatic arrangement on following organisms was tested: Thamnocephalus platyurus, Daphnia magna, Lemna minor and Sinapis alba. Secondly – leachates of soils contaminated by fire-fighting agents were evaluated using the same testing organisms to assess the effect of soil sorption complex on the possible toxicity reduction via effects of the passage through the soil matrix.

The next aim of our study was to predict the effects of extinguishing agents on soil organisms via ecotoxicological tests in the contact arrangement. For this purpose soil animal organisms as earthworm Eisenia fetida and plant organism lettuce seeds Lactuca sativa were used. Subsequently the influence of biodegradation under different conditions (light/dark; cold temperature/room temperature) on ecotoxicological effects of tested compounds again using the screening seed germination tests of L. sativa were conducted with hindsight.

The results of ecotoxicological evaluation in aquatic arrangements should be alarming. All tested extinguishing agents exhibited high ecotoxicity. The Moussol-APS F-15 was least toxic, although its toxicity was still significant. The similar trend in the reported ecotoxicity for above mentioned agents was observed in case of the tests in the contact arrangement. The results of ecotoxicity tests of water leachates of experimentally contaminated soil exhibited significant influence of soil sorption complex to reduce toxicity. In fact this toxicity reduction (retention by the soil sorption complex) is positive for aquatic ecosystem but on the other hand for soil biota it poses the risk, as was demonstrated by the test on representative soil organisms in the contact arrangement. Biodegradation at various conditions was also observed.

According to the results of the individual tests this study discusses the sensitivity of various testing organisms, the need to use the tests in contact and in aquatic arrangement for prediction of effect of various compounds on various part of ecosystem.

Finally - according to the results of the individual tests and the fact that information about hazard of the modern foam extinguishing agents to the environment (ecotoxicity) which should be a part of safety data sheet of these agents is rare or is completely absent, this study discuss the need for further evaluation of the negative influence of selected agents, while paying special attention to legislative measures.

Keywords: Fire fighting foam, ecotoxicity

Relation between the Sediment Characteristics and Toxicity; Microalgae versus Mussels

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Sediments accumulate many hydrophobic chemicals and become an important source and sink for marine ecosystems. Since assessment of sediment toxicity by chemical analysis was found to be not always reliable, sediment toxicity tests were applied complementary to both sediment elutriates and whole sediments collected from shipyards and marinas. Alginate immobilized and free cultures of microalgae *Phaeodactylum tricornutum* and mussel species of *Mytilus galloprovincialis* were employed in the tests. A strong correlation was found between the results of the toxicity tests and organic pollutant concentrations. Whole toxicity test results were found more reliable compared to the results obtained from elutriate tests when pollutant concentrations and responses of organisms were compared. The results with Ca-alginate immobilized algal cells exhibit the practical and successful usage of those organism in whole sediment toxicity testing. Elutriate testing of sediments showed no significant toxicity to the free algae, on the other hand, whole sediment toxicity results indicated that marinas and shipyards are highly contaminated with organic pollutants and are toxic to the Ca-alginate immobilized algal cells and to mussels.

Keywords: *Phaeodactylum tricornutum, Mytilus galloprovincialis*, sediment toxicity, shipyard, marina, polycyclic aromatic hydrocarbon, persistent organic pollutant

The Nanotoxic Effects of Metal Oxide Nanoparticles on *E. coli*

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The nanotoxic effects of metal oxide nanoparticles (MO-NPs) are still poorly documented while their commercialization increases in many production and manufacturing sectors. Among the various MO-NPs, TiO2, CuO, CeO2 and ZnO have being the most used NPs in industry; from wall paints to cosmetic products and from textile products to children toys. Besides their advantages and they are regarded as a biocompatible material in the absence of photoactivation, metal oxide NPs have shown to exhibit strong cytotoxicity when exposed to UV and solar irradiation.

In order to understand the bacterial responses to MO-NPs, gram-negative *E. coli* treated with different concentrations of NPs under different pH, ionic strength, in absence and in presence of visible light were studied. The end points of the microbial responses to MO-NPs were investigated in terms of cell counting and lipid peroxidation of the cell membrane. The results indicated that MO-NPs in the absence and the presence of photoactivation induced cell inactivation and lipid peroxidation. In total darkness, lower levels of lipid peroxidation were detected than those in light condition. Results also showed that as irradiation time increased the photocatalytic effect lipid peroxidation also increased. The lipid peroxidation activity showed that cell viability depend strictly on the presence of both light and MO-NPs. It can be concluded that MO-NPs promoted the peroxidation of the polyunsaturated phospholipid component of the lipid membrane initially and induced major disorder in the bacteria cell membrane. Subsequently, essential functions that rely on intact cell membrane architecture were lost, then cell death was inevitable. The results also highlight the need for caution during the use and disposal of such manufactured nanomaterials to prevent unintended environmental impacts, as well as the importance of further research on the mechanisms and factors that increase ecotoxicity to enhance risk management.

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Emerging pollutants

A detailed multi-compartmental skin penetration model coupled to a physiologically based pharmacokinetic model for assessing exposure to endocrine disrupting chemicals

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Reliable predictions of chemical transport through skin are important for risk and safety assessment of environmental chemicals. The study deals with the development of a multi-compartmental model of the skin (described by second order partial diffusion equations) for explicit description of penetration, absorption and potential metabolism of chemical compounds under different realistic exposure scenarios. The generic character of the model is supported by calculating input diffusion and partition coefficients from correlations with the octanol/water partition coefficient. The detailed skin model was coupled to a generic physiology-based pharmacokinetic (PBPK) model. The integrated model system allows capturing the contribution of dermal exposure to the overall bioavailabilty of toxic compounds in complex aggregate exposure scenarios. The modeling framework was developed in the dynamic modelling environment acslXtreme. The model was applied in the case of bisphenol A (BPA), a common plasticizer with endocrine disrupting properties found in many consumer products (mainly food contact materials), as well as in thermal printing paper and money. Thus BPA comes regularly in contact with human skin. Parameterization of the model was based on recent in vivo studies relevant to BPA permeation.

Among several typical exposure scenarios examined to examine the relative exposure of different population sub-groups to the substance, we focused on the case of cashiers who are burdened by an additional daily intake of BPA up to 71 μg during a 10-hour shift via dermal contact with the thermal paper used in cash receipts. It was found that the extent of metabolism to inactive BPA–glucuronide was only 2% during the first 24 h; during this time ca. 90% of the dermal dose is absorbed. Thus, although BPA penetrates slowly the layers of the skin entering systemic circulation, its contribution to the overall bioavailability is significant, since dermally absorbed BPA is not subjected to 1st pass metabolism (as is the case of oral exposure), which occurs at the liver. As a result, for the same normalized bodyweight dose, in terms of internal dosimetry, skin absorbed BPA corresponds to a dose twice as high as the one taken orally. However, even in the worst-case scenario of skin exposure to BPA (71μg/day), internal exposure is two orders of magnitude lower than the internal dose that corresponds to the EFSA tolerable daily intake (TDI) of 50 μg/kg_bw/day (via the oral route).

Keywords: Skin model, endocrine disruptors, bioavailability, chemical exposure

Probabilistic assessment of pesticide exposure via inhalation in Greece

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In this study exposure via inhalation from pesticides use in Greece is examined. Emission data from an Active Substances (AS) emission inventory are used as input to a short range transport model, allowing computation of daily average concentrations per active substance. This model takes into account the dynamic variation in emission and physico-chemical properties of AS. Then an exposure model is developed to compute intake from daily average AS concentrations. Intake rates (in mg/kg/day) per AS and crop are calculated, using data on body weight and inhalation rate (stratified by age and gender). The exposed agricultural population is categorized into infants, children aged 4 to 9 and 10 to 14 years, adult females and males. Exposure to pesticides is also assessed using global sensitivity analysis methods, where changes in the intake rate are dealt with in the context of model input variability. Significant model inputs are categorized as physiological (body weight and inhalation rate), meteorological (wind speed and mixing height), physical (daily emission profiles, total application window, differences on pesticide application to crops) and physico-chemical properties per AS. Following sensitivity analysis, uncertainty assessment is investigated via Monte Carlo Simulation (MCS). Therefore, from the computed intake distributions per grid cell, significant statistical properties are extracted, including the tail of the distribution (e.g. 95th percentile), the central tendency (e.g., mean and median), or any other desired level of probability.

In this study, crops from permanent (fruit trees and vineyards) and seasonal plants (cereals and maize) are considered. Intake rates per crop are obtained at a spatial resolution of 1x1 km. Results show that intake rates of pesticides vary significantly across Greece. Intake rates for adult males from permanent crops are much higher compared to intake rates from the seasonal plants. A differentiation is made between carcinogenic and non carcinogenic pesticides. The former group is further examined on the basis of a hazard factor that accounts for both toxicity and persistence of AS in the environment.

Keywords: Pesticides, exposure, inhalation route, intake rates, Global Sensitivity Analysis, Monte Carlo Simulation

Degradation of Bisphenol A by UV-C photolysis and persulfate/ UV-C process: Ecotoxicological assessment by a multitrophic battery test

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Advanced oxidation processes (AOPs) have been widely used in water and wastewater treatment for the removal of endocrine disrupting compounds (EDCs) such as pesticides, alkylphenols, bisphenol A (BPA) etc. Until now, removal efficiencies and kinetics have been generally assessed by the measurement of the target pollutant and total organic carbon (TOC). However, these analytical tools provide only limited information on the potential adverse effects of treated water or wastewater bearing EDCs in the aquatic and terrestrial environment. Since the partial oxidation of EDCs could result in the formation of intermediates being more toxic than the parent pollutant of interest, toxicity testing might be used to indicate the potential effects of EDCs and their degradation products. Considering that the ecotoxicological assessment of advanced oxidation products is an important and practical tool, the acute and sub-chronic toxicity of BPA and its photochemical degradation products was assessed on three different trophic levels; namely the

(i)green microalgae *Pseudokirchneriella subcapitata* (producer level),
(ii)freshwater cladoceran *Daphnia magna* (consumer level) and
(iii)photobacterium *Vibrio fischeri* (decomposer level) by conducting a battery test.

Battery tests are of vital importance for toxicity assessment of pollutants and their degradation products since the response and sensitivity may vary tremendously depending upon the pollutant type and test organism under study.

Within the scope of the present study, UV-C and PS/UV-C treatment experiments were conducted with 20mg/L aqueous BPA. Based on preliminary experiments and previous related literature, optimum reaction conditions were set as an initial PS concentration of 2.5 mM and an initial reaction pH of 6.5. The test species used in the present study demonstrated varying sensitivity to 20mg/L aqueous BPA solution being 79%, 38% and 95% for *V.fischeri, P.subcapitata and D.magna*, respectively. Experimental results indicated that direct UV-C photolysis appeared to be inefficient in the removal of BPA (58%) and TOC (3%) after 60 min irradiation. In parallel to these results a slight decrease in toxicities was observed during UV-C photolysis achieving %64, %38 and %90 inhibition of *V.fischeri, P.subcapitata and D.magna*, respectively. By the PS/UV-C oxidation, BPA removal was completed after 3 min treatment and 84% TOC removal was obtained after 60 min treatment. During PS/UV-C oxidation of BPA; the relative inhibition of *V.fischeri and P.subcapitata* decreased to 1-2% and 9%, respectively after 10 min treatment and did not change thereafter. However, a prompt reduction in toxicities towards D.magna from 95% to 50% after 1 min was followed by an abrupt reincrease to 95% after 5 min PS/UV-C treatment, thereafter decreasing to 45% at the end of photochemical treatment, indicating the formation and subsequent degradation of relatively toxic oxidation products.

The results of the present study emphasized the importance of battery tests to elucidate the risk of employing AOPs for the treatment of industrial pollutants including EDCs. Decision on the feasibility of a treatment application should not only rely on treatability studies but definitely also on practical tools to elucidate the effects of degradation products on organisms of different trophic levels and the temporal (brief- or long-term) response of test species.

Keywords: Bisphenol A, UV-C photolysis, Persulfate/UV-C process, Batery tests, Daphnia magna, *Pseudokirchneriella subcapitata, Vibrio fischeri*

Electromagnetic Fields (EMF) Environmental Pollution and the MUOS Case

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Recent and very recent scientific literature shows that both biological and sanitary effects of EMF radiations – from the extremely low frequency magnetic fields (ELF/EMF) to the high and very high radiofrequencies (RF/EMF) – are clearly established and occur even at very low exposure levels. Overall, there are now almost 4.000 experimental studies that report a variety of short and medium-term effects of EMF, which support the biological plausibility of the increased risks of their long-term genotoxic, carcinogenic and neurodegenerative consequences on exposed human populations.

Many of these bioeffects can reasonably be presumed to result in adverse health effects if the exposures are prolonged or chronic. This is because they interfere with normal body processes (disrupt homeostasis), prevent the body from healing damaged DNA, produce immune system imbalances, metabolic disruption and lower resilience to disease across multiple pathways. Essential body processes can eventually be disabled by incessant external stresses (from system-wide electrophysiological interference) and lead to pervasive impairment of behavioural metabolic and reproductive functions. There is good evidence to suggest that many toxic exposures to the fetus and very young child have especially detrimental consequences depending on when they occur during critical phases of growth and development (time windows of critical development), or where such exposures may lay the seeds of health harm that develops even decades later. Existing FCC and ICNIRP public safety limits are not sufficiently protective of public health, in particular for the young subjects - embryos, fetuses, neonates, very young children – and for those which are exposed to extremely high ELF and RF/EMF levels.

Sufficient evidence comes from epidemiological studies of an increased risk from exposure to EMF of adverse acute effects and even long-term carcinogenic effects that cannot be attributed to chance, bias or confounding. Therefore, according to the rules of IARC, such exposures can be classified at least as Group 2 "probable carcinogenic agents for humans".

The MUOS (Mobile User Objective System) is a military radio-transmission system that is proposed for installation close to the small village of Niscemi (Sicily, Italy). The area has already installed 41 other antennas in the NRTF (Naval Radio Transmitter Facility) and some data and measurements on the EMF pollution in the area due to NRTF will be presented too, showing an excess compared to the Italian Law. Our study presents the results of electromagnetic radiation models in that area and documents the scientific sanitary reasons why the MUOS system should not be installed in Niscemi.

Keywords: Electromagnetic Fields, EMF, Environmental Pollution, MUOS, NRTF

Pharmaceuticals in waters: Sources, occurrence and chemical analysis

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In recent years, pharmaceuticals, an important group of emerging contaminants in the environment, have attracted worldwide attention. The usage and consumption are increasing consistently due to the discoveries of new drugs, the expanding population, and the inverting age structure in the general population.

Most PhACs are small organic molecules (Mw<1000 Da), moderately hydrophilic but also lipophilic to be bioavailable and biologically active. After intake, the PhACs undergo metabolic processes in organism. Significant fractions of the parent compound are excreted in unmetabolized form or as active/inactive metabolites into raw sewage and wastewater treatment systems. Municipal sewage treatment plant effluents are discharged to water bodies or reused for irrigation, and biosolids produced are reused in agriculture as soil amendment or disposed to landfill. Thus, body metabolization and excretion followed by wastewater treatment is considered to be the primary pathway of pharmaceuticals to the environment. Disposal of drug leftovers to sewage and trash is another source of entry, but its relative significance is unknown with respect to the overall levels of pharmaceuticals in the environment. Although the production of drugs is governed by rigorous regulations, pharmaceuticals are frequently released with the waste from drug manufacturing plants. The contribution to the contamination of surface and groundwater during manufacturing is unknown. Once entered the environment, pharmaceutically active compounds can bioaccumulate and produce subtle effects on aquatic and terrestrial organisms, especially on the former since they are exposed to long-term continuous influx of wastewater effluents. An important characteristic of pharmaceuticals is their pharmacological activity that can affect biological endocrine systems and result in effects on growth, development, or reproduction at much lower concentration levels than would be expected on the basis of their acute toxicity.

For all this, the occurrence of pharmaceutical compounds in the environment and their potential effects on human and environmental health as well as the extent to which they can be eliminated during wastewater treatment have become active subject matter of actual research. There is still limited knowledge on concentration, fate and effect of drugs in the environment and they have not yet been included in any environmental regulation.

In the light of these concerns, the aim of the present work was to give an overview of the occurrence and distribution of pharmaceuticals in the environmental, waste and drinking waters, reported for the European countries, primarily in Spain and Serbia. Furthermore, the intention was to summarize the analytical methodologies for the analysis of pharmaceuticals in wastewater and sludge, emphisizing the latest trend of the multi-residue analysis of pharmaceuticals that have been develop to cover a wide range of physicochemical properties at trace levels while minimizing sample collection and preparation time and overall costs. Nevertheless, for reliable and reproducible multi-residue analytical methods, a compromise in the selection of experimental conditions is required and the analytical performance cannot be optimum for every single compound.

Keywords: Pharmaceuticals, water, occurence, analysis

Analysis and Fate of Chlorinated Paraffins in the Environment

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Chlorinated paraffins (CPs), also known as polychlorinated n-alkanes (PCA), are complex mixtures consisting of thousands of isomers which are also not possible to be completely separated by HR-GC. The technical mixtures are produced by chlorination of n-alkane feedstock under forcing conditions; over 200 commercial products with different compositions are available. Thus, for a proper quantification a suitable standard has to be selected. For these reasons, the analysis of CPs is difficult and only limited information on CPs in environmental samples are available.

With reference to their chain lengths, CPs are classified as short (C10-C13), middle (C14-C17) and long (C18-C30) chain chlorinated paraffins (SCCPs/MCCPs/LCCPs). Corresponding to their intended use, the chlorine content varies between 30% and 70%. The application range of CPs is wide: e.g. as fire retardants, plasticizers or additives in paints, sealants or rubber and in a number of other industrial applications. Annual global production of CPs is assumingly more than 600 kilo tonnes, with a majority having MCCPs. Since 2004, SCCPs may not be used (in concentrations higher than >1 %) in metal-working and for liquoring of leather in the European Union.

Analysis of CPs is challenging. These products are extraordinarily complex mixtures, consisting of thousands of congeners. A chromatographic separation of all components of a CP mixture is still not possible, even by high resolution gas chromatography. As a result, chromatograms show a broad hump with several broad bands representing the co-elution of numerous congeners.

Different techniques have been tested to establish a reliable and reproducible quantification procedure for CP analysis. Electron capture detection (ECD) and electron capture negative ion (ECNI) are particularly suitable for the determination of residual amounts of CPs, but the high dependence of detector response on the number of chlorine atoms in a compound is a major problem. In addition, it is difficult to find a standard that matches with regards to the composition of CPs in the sample. In the past, several methods have been applied to overcome the uncertainty related to different detector responses of CPs with varying chlorine contents when using ECNI-MS.

Chlorinated paraffins have been detected in waste water, in indoor and outdoor air, in marine organisms and in other matrices. Concentrations vary largely.

Keywords: Chlorinated Paraffins, Occurence, Analysis

MgO Implementation on Spent With Arsenic Iron Oxy-Hydroxides Regeneration

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In recent years the presence of arsenic in drinking water at concentrations higher than Maximum Contamination Level (10 μg/L) led to the appearance of many removal methods with adsorption being the most commonly used. The most significant disadvantage of adsorption is the cost of the adsorbents, which in turn results in high water cost. Consequently, the regeneration of the conventional spent adsorbents may decrease total cost of water treatment. Most of the spent adsorbents can be regenerated by a NaOH solution, since NaOH effectively leaches adsorbed arsenic. The problem that arises from the process is the handling of the regeneration solution which is enriched with the toxic arsenic. Thus, most adsorbents are commonly employed solely on a replacement (throw-away) basis. The purpose of this work was to investigate the arsenic uptake by MgO from solutions of high pH values, commonly applied for adsorbents regeneration, and to suggest an innovative procedure for in situ regeneration.

Magnesium oxide (MgO) as an alkaline earth metal oxide is a low cost material with a simple pro-duction process from abundant natural minerals. Researches over the last years showed that MgO presents high adsorption capacity for As(V) and As(III) at common pH range commonly encountered in potable water. In this study it was also found that MgO is more effective for removing both arsenic species at high pH values (10-12). Adsorption isotherms for As(V) are best described by the Langmuir model, indicating monolayer coverage of the adsorbent' surface. Maximum adsorption capacity was observed at pH 10 (Q_{max} = 59.9 mg As(V)/g). On the contrary As(III) adsorption follows S-type isotherms indicating lower affinity and "cooperative adsorption" with maximum adsorption capacity at pH 11 (53 mg As(III)/g).

Here, MgO was used for the in-situ regeneration of an As(V)-saturated iron oxy-hydroxide column. Regeneration was carried out using a 0.05 N NaOH solution in a continuously recirculation configuration. NaOH solution run in up-flow mode through FeOOH Rapid Small Scale Column (RSSC) for leaching As(V) and in down-flow through MgO RSSC for removing arsenic from the liquid phase. Regeneration process was completed within 24 hours, while the arsenic content of FeOOH was reduced from 8.5 mg As/g to 0.9 mg As/g. The adsorption capacity of the regenerated FeOOH was found around 20% lower, which is equally attributed to the remaining arsenic content (0.9 mg As/g) as well as to the remaining phosphates and silicates.

Moreover, arsenic residual concentration at the outflow of MgO column was below 10 μg/L, which indicates that NaOH solution was ready for a new regeneration process. For its stabilization, spent MgO was incorporated in cement products at 3 %wt and 5 %wt of total mass. Leaching tests (EN 12457-2 και TCLP) showed an extremely low leachability of arsenic, while compressive strength tests indicated that the addition of MgO up to 3 % wt does not substantially affect the mechanical properties of the samples. Therefore, the stabilization of spent MgO in commercial cement products it appears possible resulting also in profitable economics.

Keywords: Magnesium oxide, arsenic, adsorbents regeneration

Hazard Assessment of Emerging Pollutants: QSAR/QSPR models developed in the FP7 European Project CADASTER

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Four classes of emerging pollutants (brominated flame retardants, fragrances, perfluorinated compounds and (benzo)triazoles) were studied within the FP7 European project CADASTER (CAse studies on the Development and Application of in-Silico Techniques for Environmental hazard and Risk assessment). The EU-REACH regulation encourages the use of alternative in vitro and in silico methods in order to minimize animal testing, costs and time. Among these methods, quantitative structure-activity relationships (QSARs) represent a useful tool to predict unknown activities/properties for existing or even not yet synthesized chemicals. The development and validation of QSAR models was the central part of this project. The final goal was to exemplify the integration of information, models and strategies for carrying out hazard and risk assessments for large numbers of substances, organized in the four representative chemical classes. The aim of this poster is to summarize the Insubria modelling activities within the CADASTER project, and the QSAR/QSPR models developed for the four classes of compounds under investigation. For each class, ad hoc QSARs (both regression and classification models) were developed for the available experimental data (i.e. physico-chemical properties, environmental and mammalian toxicity, biodegradability) in order to characterize environmental behavior and activity profile of the chemicals. In agreement with the OECD principles for the validation of QSARs for regulatory purposes, all the proposed models were checked for their robustness, external predictivity and applicability domain to new chemicals. QSAR predictions, together with structural analysis (e.g. similarity analysis and multivariate ranking methods), were used for the identification of priority compounds (also present in the ECHA pre-registration list), in order to focus necessary experimental testing.

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Keywords: Emerging pollutants, hazard assessment, ecotoxicity, QSAR models, prioritization

Evaluation of microextraction method for the determination of trace levels of endocrine disruptor chemicals in food samples

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In recent years effects have been reported in animal species and human beings that are attributed to the influence of certain substances on hormonal systems. Endocrine disrupting compounds (EDCs) are chemicals that may interfere with the body's endocrine system and produce adverse developmental, reproductive, neurological, and immune effects. Food is likely to be one of the most important routes of human exposure to EDCs. Therefore, an urgent demand appears for the development of analytical methods to monitor Endocrine Disrupting Compounds (EDCs) in food so that regulatory limits may be enforced.

In the present study endocrine disruptor pesticides belonging to different chemical classes (organochlorines, organophosphorous, organophosphates, pyrethroids, dicarboximides, dinitroanilines, imidazoles, triazinones,) were analyzed in fruits and vegetables from the region of Epirus (NW Greece) by means of ultrasound-assisted emulsification–microextraction (USAEME) coupled with gas chromatography-mass spectrometry (GC-MS). Optimization of the variables affecting the extraction yield of USAEME was carried out. High level of linearity for all target analytes was recorded with correlation of determination values (R^2) above 0.990, while repeatability (intra-day) and reproducibility (inter-day) varied from 7% to 12% and 9% to 17%, respectively. Limits of detection (LODs) and limits of quantification (LOQs) were found to range in the low ppb level. The proposed method provides high selectivity, enrichment and reproducibility, and was applied for the determination of the target EDCs in fruit and vegetables samples taken from traditional and local markets from the region of Epirus (NW Greece).

Keywords: Endocrine disrupters, ultrasound-assisted emulsification–microextraction

Anaerobic degradability of diclofenac under mesophilic conditions

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Diclofenac is one of the most commonly used non-steroidal anti-inflammatory drugs (NSAID) with a global consumption rate of 940 tonnes/year (Al-Rajab et al, 2010). Recent studies report that the removal of diclofenac in wastewater treatment plants is often incomplete (Zhang et al., 2008) resulting in a continuous release into the aquatic environment that may lead to the long-term chronic exposure (Garcia-Lor et al., 2012).

A cultures was developed from an anaerobic digestion sludge of a municipal wastewater treatment plant located in Kayseri, Turkey to investigate diclofenac degradability under anaerobic mesophilic conditions. The cultures was initiated by diluting 100 mL digestion sludge in 1.4 L of mineral media in a N2-flushed, 2 L glass flask reactor, capped with a Teflon-lined stopper. At the beginning of each 7 day feeding cycle, glucose, yeast extract, and diclofenac in methanol were added resulting in initial concentrations of 300 mg/L, 15 mg/L, 10 μg/L respectively. The fresh media was added to the reactor by wasting 245 mL culture from the completely mixing reactor every two weeks. The weekly fed COD concentration in the reactor was 343 mg/L. The culture was kept in the dark in a 35°C constant temperature room and were stirred once a day. The microbial activity of the culture was monitored by measuring gas production, gas composition, pH, Total Suspended Solids (TSS), Volatile Suspended Solids (VSS), Volatile Fatty Acids (VFAs), Total Organic Carbon (TOC) and Dissolved Organic Carbon (DOC) concentrations.

The constant biogas production was observed after 20 days incubation period (320 mL) which is in accordance with the theoratically calculated gas production. At the initial days of the acclimation period diclofenac removal was not achived. Hovever, after 70 days acclimation period partial diclofenac degradation was observed in the reactor. Maximum diclofenac removal efficiency has been 20 % averagely. Similar to our result, Lahti and Oikari (2011) has been reported 26 % diclofenac degradation with an anaerobically digested sludge at 35ºC.

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Environment and health

Environment and Health in Europe: views from WHO

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Progress on environment and health in the WHO European Region, comprising 53 member States, has been marked over the last decades, with many people in Europe living longer and better than ever before. However, significant cause for concern remains, and environmental determinants of health are estimated to account for approximately 20% of total mortality and up to 25% of the total burden of disease. These impacts are distributed unevenly between and within countries, and across socio-demographic population subgroups. This results in large societal and economic costs, prevents the fulfillment of health and wellbeing potentials for all, and undermines societal and economic development.

Since the late 1980s, WHO has been promoting a cross-sectoral dialogue, between the health and the environment sectors, aiming at identifying priorities and tackling them through appropriate policy responses. The Fifth Ministerial Conference on Environment and Health, hosted by Italy in 2010, is the latest milestone in the European environment and health process. Focused on protecting children's health in a changing environment, the Conference set Europe's agenda on emerging environmental health challenges for the years to come. The Parma Declaration is the first time-bound outcome of the environment and health process. The 53 Member States in the WHO European Region set clear targets to reduce the harm to health from environmental threats in the next decade.

This work, over the years, has been instrumental in clarifying the need to address both established determinants, through best use of evidence-informed policies, and emerging risk factors, so as to anticipate health impacts as much as possible. Progress is only possible through collaborative, concerted action, involving relevant stakeholders, from scientists to policy makers, from civil society to international organizations. Also, it is important to explore and identify possible commonalities and patterns shared by countries at the sub-regional level: examples include dedicated work done for Newly Independent States of the former Soviet Union, or south-eastern European countries in the Balkans – an approach that could in principle be considered for Mediterranean countries. As the European Environment and Health Process proceeds towards a sixth Ministerial Conference, expected for 2016, it is important to assess progress, to identify emerging issues and use imaginative, proactive approaches to further support the implementation of health-friendly policies across Europe and beyond.

Keywords: WHO, environment and health, Europe, health-friendly policies

INTERA platform: a tool for mechanistic risk assessment of indoor air pollutants

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This study, carried out in the frame of the CEFIC-LRI funded INTERA project (http://www.intera.cperi.certh.gr/main.php), aimed to develop a mechanistic modelling approach for assessing aggregate and cumulative exposure to pollutants commonly found indoors.

The developed modelling approach has been implemented in a user-friendly web-based computational platform that allows the inter-connection between several steps of the full-chain assessment through proper models and algorithms.

The web-based modelling platform comprises four modules, as follows:

1. Emissions-concentrations module, linking emission sources to indoor air concentrations through IAQ modelling, taking into account the physicochemical processes occurring in indoor settings (including ventilation regimes, indoor:outdoor air interaction and gas- particle-dust partitioning).

2. Exposure module, linking the temporal variation of indoor air pollution levels to human exposure taking into account time activity patterns, housing conditions and variables inhalation rates based on activity type.

3. Internal dosimetry module, linking the temporal variation of exposure to internal dose dynamics through the development of a generic Physiology Based PharmacoKinetic/Dynamic model which accounts for different gender and age class. This allows the estimation of mixture effects, as well as the interpretation of biomarker data, which become increasingly available through recent human biomonitoring programs.

4. Uncertainty and variability of exposure and risk determinants are assessed along the full chain assessment through hierarchical modelling using Markov Chain Monte Carlo.

The methodology described above introduces a more biologically based dose response approach for indoor air risk assessment. Its implementation in a user-friendly web-based computational environment allows any user to easily build exposure scenarios and run them to estimate both external and internal exposure in indoor settings for the whole population as well as for some sensitive groups. The platform addresses public health risk with a lower degree of uncertainty reducing unnecessary conservatism and allowing for a more comprehensive cost/benefit analysis and efficient risk management. The applicability of the methodology and the computational tool was evaluated for three different case studies related to different types of chemicals (BTEX, DEHP and mercury).

Keywords: Exposure, computational tool, indoor environment, computational web, modeling

Carcinogenicity risk of PAHs in Particulate Matter

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In this study, the carcinogenic risk from poly-aromatic hydrocarbons (PAHs) in particulate matter, in the area of Thessaloniki, Greece is investigated. A 6 month campaign (October 2012 - mid-April 2013) of ambient air PM measurements was carried out, capturing the transition between the warm and cold period of the year. PM2.5 and PM10 particles were collected in Teflon filters using low-flow air samplers in two air pollution monitoring stations, representative of urban/residential and traffic-influenced pollution respectively. The samplers operated at a flow-rate of 38 L·min-1, with a collection time per sample of 24 h.

Nineteen individual PAHs were analyzed by GC/MS and concentrations in air were calculated for both monitoring stations. Potential cancer risk due to exposure to the mixture of urban ambient air PAHs was calculated using the toxicity equivalent factor (TEF) approach based on Benzo(a)pyrene (B[a]P). The BaP-TEQ (Toxicity Equivalent Quotient) (carcinogenicity equivalent, in ng/m3) was calculated by multiplying the concentrations of each compound in the PAH mix with the respective TEF for cancer potency relative to BaP. The TEQ was multiplied with the B[a]P Inhalation Unit Risk (equal to $0.88 \cdot 10^{-6}$ (ng/m3)-1) so as to compute the cancer risk of the urban population.

The results showed that PM (PM2.5, PM10) as well as PAHs concentrations during the cold period are higher in the urban background monitoring station compared to the traffic station. Overall, the average individual cancer risk due to ambient air PAHs for the urban population is about $2.2 \cdot 10^{-6}$. While in the past PM was credited mostly to traffic (close to the city center) and industrial sources (western suburbs), recently there is a shift in favor of domestic heating and more specifically to biomass burning. The latter is evident by the comparison of PM concentrations between years 2011 and 2012 (especially when comparing the transition from the warm to the cold period), as well as from the presence of levoglucosan – which is a definite biomass burning tracer – during the cold period of the year. Levoglucosan analysis allowed the estimation of biomass burning contribution to the overall PAHs induced risk, which accounted for 34% for the majority of the city population.

Keywords: PAH, cancer, particulate matter, carcinogenicity equivalent

PM attributed mortality and morbidity due to biomass use in Thessaloniki – estimation of socioeconomic cost

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Since 2011 the use of biomass as heating source was allowed in Greece as a CO_2-neutral means of space heating in the large metropolitan areas of Athens and Thessaloniki affecting more than half of the country's population. At the same time the use of light heating diesel was heavily taxed. In the same period Greece faces a financial crisis with significant repercussions on the average household income. This combination resulted in reduced traffic loads but excessive biomass use for domestic heating.

In this context, the current study deals with the assessment of the seasonal variability of PM exposure and the related health and monetary impact in the city of Thessaloniki (Greece). A combination of measured and modeled data of outdoor and indoor PM10 and PM2.5 were generated, feeding a composite integrative exposure assessment system that takes into account indoor air quality modeling, time activity patterns and activity based inhalation rates. The measurement campaign included the assessment of outdoor and indoor air quality and the evaluation of biomass use for domestic heating in open fireplaces and woodstoves. Measured concentrations of PM10 and PM2.5 were used as input to the computational platform INTERA, for assessing population exposure. INTERA incorporates the combined effects of outdoor air penetration, presence of indoor sources, housing conditions, and the time activity patterns of the exposed population. Health impacts were assessed adapting well-established exposure-response functions; monetary cost of these impacts was calculated based on the valuation of the willingness-to-pay/accept (WTP/WTA), to avoid/compensate for the loss of welfare associated with these health impacts.

Outdoor measurements highlighted a significant increase of PM10 (from 30.1 to 73.1 µg/m3) and PM2.5 (from 19.4 to 62.7 µg/m3) concentrations during the transition from the warm to the cold period in 2012, in contrast to 2011, when this transition was accompanied by an increase of 12 µg/m3 for both PM10 and PM2.5. Between the two years, there is a significant variation in emission patterns. In 2012 the traffic contribution appears to be reduced, while during the colder period the contribution of biomass combustion increases dramatically; the latter is verified by the positively correlated levoglucosan concentrations to ambient air PM concentrations. Indoor concentrations followed a similar pattern, while in the case of fireplace use, average daily concentrations rise up to 10 µg/m3 and 14 µg/m3 for PM2.5 and PM10 respectively. Health and monetary impacts (e.g. 40% increase in PM attributed mortality) in 2012 are estimated to be more severe during the cold period, despite its smaller duration (4 months). Our results would indicate that policy measures affecting fuels/technologies used for domestic heating might need to be reconsidered to internalize the socioeconomic cost of increased mid-term morbidity and mortality.

Keywords: PM; mortality; morbidity; biomass combustion, socioeconomic cost, externalities

A tiered approach for aggregate exposure assessment: the case of Bisphenol-A

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The study describes the tiered aggregate exposure assessment methodology developed to provide a realistic estimation of exposure to substances from multiple sources.

The approach initially lies on an extensive review of existing data, models and methodologies, aiming to compile a new overall methodology, adding the necessary elements for an as much realistic exposure assessment. The structured methodology is implemented in a novel computational platform supporting source-to-dose aggregate exposure assessment (under different tiers of complexity) and biomonitoring data assimilation, by incorporating multimedia, multi –pathway and route – and internal exposure assessment. Moving from lower to the higher tiers is based on the Risk Characterization Ratio (RCR) derived in each tier. If RCR is higher than one, a refinement of the assessment is required, imposing the use of more refined data (e.g. contamination levels distributions than worst case estimates), models (e.g. use of more detailed environmental fate models), assimilation of complex data (e.g biomarkers data and use of toxicokinetic models) as well as Biomonitoring Equivalents for RCR assessment.

The applicability of the overall methodology was tested in the case study of bisphenol A (BPA). Tier 1 assessment indicated that all consumer exposure scenarios (except for premature neonates hosted in intensive care units) are below the EFSA Tolerable Daily Intake (TDI), thus RCR is below 1 indicating that the use of BPA under the current exposure scenarios is generally safe. Based on the identification of individual consumer exposure scenarios where RCR exceeds 1, we proceeded to a two-stage detailed Tiered 2 analysis. Tier 2a analysis incorporated the use of probability distributions for exposure determinants (replacing conservative worst case estimates) and a more detailed multimedia environmental model (EUSES instead of ECETOC TRA). The overall RCR calculation was greatly facilitated by the use of probabilistic modeling. Tier 2b analysis incorporated in addition detailed toxicokinetic analysis of BPA, as well as the use of a Biomonitoring Equivalence (BE) value (derived as the internal dose corresponding to a constant oral dosing to an adult equal to the EFSA TDI) for reckoning the RCR. Due to the specific toxicokinetic behavior of BPA (very rapid 1st pass metabolism and strong binding to red blood cells), significant bioavailability differences were identified depending on developmental stage (glucuronidation, which is the major detoxification pathway, is considered to be immature in neonates and infants) and administration route (up to six times higher levels of free plasma BPA for inhalation uptake). Thus, specific exposure scenarios indicating an uptake lower than EFSA TDI (related to neonates and infants), correspond to an internal dose close (or higher) than the derived BE value.

Keywords: Aggregate exposure, risk characterization, bisphenol A

SOS – lung region specific oxidative stress: a novel exposure metric for airborne PM

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Even though well-documented associations have been established between urban air PM and mortality/morbidity, incorporating internal exposure and toxicity metrics would be expected to refine risk estimation. The current study provides a methodological framework for introducing more environmental information into environment and health associations, by deriving a composite exposure metric we call "region specific oxidative stress index - SOS". The latter takes into account the size specific mass deposited to region of the Human Respiratory Tract (HRT) as well as the size specific Reactive Oxygen Species (ROS) generating potential of PM; based on the PM size specific oxidative potential and the deposition across HRT, the "region specific oxidative stress index" is calculated as the product of the size specific mass deposited to the HRT region, multiplied by the oxidative potential of this size specific PM thus, we surmise that it is a more relevant metric for PM health associations.

To investigate the feasibility of using this approach an extensive measurement campaign was carried out in a large Metropolitan area in Greece. PM size and number distributions were recorded in four sites. PM10, PM2.5, PM1 and UFPs samples were analyzed for oxidative potential by measuring ROS using the DTT protocol. Results showed that the fine particle concentration is higher in the city center than in the suburbs. The same is true for the oxidative potential especially for the smaller particles. Thus, the difference between actual exposure in the different monitoring sites for endpoints related to lower respiratory tract deposition and possibly translocation within the systemic circulation (e.g. cardiovascular disease, adverse pregnancy outcomes) might be up to 4 times higher than the one estimated by the respective differences in mass concentration. The SOS index proposed herein, could serve as a starting point for re-evaluating environmental information (PM measurements and ROS analysis), in order to provide an intermediate advancement between existing concentration-response functions that mostly associate coarse PM to mortality and morbidity. The proposed methodology highlights exposure- and toxicity-related differences that are far from captured by PM mass concentration measurements:

- differences in PMs size distributions across the sampling sites, and how these are translated into HRT deposition values
- differences in the oxidative potential of the different size PMs, and more specifically clustered according to their deposition behavior in specific regions of the HRT.

The latter is of great importance, since it allows linking region-specific oxidative stress values to specific health endpoints, namely respiratory hospital admissions including influenza to upper HRT regions, while cardiovascular diseases to lower HRT. Although this more targeted association requires a deeper knowledge of the mechanisms that control how PM exposure affects disease onset or exacerbation, it will also facilitate these investigations. The SOS index is expected to be better correlated to markers of systemic inflammation such as glutathione (GSH), considering that the rate-limiting enzyme in GSH synthesis is redox-sensitive, or to urinary 8-hydroxy-20-deoxyguanosine, a biomarker of oxidative stress.

Keywords: oxidative stress, lung deposition, exposure, particulate matter, health risk

Epidemic situation and Human-Environment factors conditioning the emergence of Cutaneous leishmaniasis in Morocco

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Morocco lies in the Mediterranean region where leishmaniasis is prevalent. The latter, a vector borne disease, affects 2 million people annually in more than 100 countries whose populations are at risk for the disease inflicts high economic costs.

In Morocco, cutaneous leishmaniasis (CL) are caused by three clinically important Leishmania species (*L. major*, *L. tropica* and *L. infantum*), a flagellate protozoa of the Family of Trypanosomatidae.

In this work, we show the evolution of leishmaniasis numbers of cases in sub-saharan area of Morocco during the 20 past years (1990-2010). We'll discuss the relationship between the cutaneous leishmaniasis due to L. major forms and the areas where they have been respectively reported to.

Results suggest that in this area, changes in climate may have initiated a trophic cascade that resulted in an increase in cutaneous leishmaniasis incidence. We find the correlation between the rainy season precipitation and the same year NDVI to be strong for both regions while the number of cases of incidence lags the precipitation and NDVI by 2 years.

Also we aims to identify all the sensitivity factors (Human- Environment) aggravating the epidemic situation. It is a alarmist contribution about the situation of cutaneous leishmaniasis (CL).

So proactive health adaptation strategies are needed to protect the most vulnerable population from the effects of climate change on human health and well-being.

Keywords: Cutaneous leishmaniasis, climate, vulnerability, sub-Saharan area, Morocco

New Techniques in Environmental Monitoring: The Using Capacity of Carbon Fiber Electrodes in DNA Biosensors for Microbial Identification

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The detection of specific DNA sequences is of significance in many areas including clinical, food, biological warfare agent and environmental analysis. The increasing number of potentially harmful pollutants in the environment calls for fast and cost-effective analytical techniques to be used in extensive monitoring programs. Biosensors can be used as environmental quality monitoring tools. For environmental applications, the main advantages offered by biosensors over conventional analytical techniques are the possibility of portability, miniaturization, work on-site, and the ability to measure pollutants in complex matrices with minimal sample preparation. carbon fiber microelectrodes (CFMEs) have not been used in electrochemical DNA biosensor for environmental monitoring. The ever increasing sensitivity and selectivity of CFMEs will facilitate detection of even lower concentration of analytes and the number of detectable and biologically important species will probably increase.

Immobilization and hybridization techniques for carbon fiber electrodes are determined. The interactions between methylene blue (MB) and DNA immobilized on CFMEs is followed as electrochemically and experimental parameters are determined. This work might provide useful information for developing CFMEs-based sequence-specific electrochemical DNA sensors. Immobilization and hybridization are optimized and different electrode materials (glassy carbon, gold electrode etc.) are compared with CFMEs. Electrochemical detection techniques for hybridization using methylene blue is improved.

Electrochemical detection techniques of hybridization are proposed to enhance the DNA sensing capacity of CFMEs. The experiences of accumulated MB on DNA-modified carbon fibers are transferred to produce the stem–loop structure DNA probes and PNA capture probes on the CFMEs.

Keywords: Environmental monitoring, carbon fiber microelectrode, DNA biosensor

Detection of *Pseudomonas* spp. from seawater in the Istanbul coastal area

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Pseudomonads are a large group of free-living bacteria that live primarily in soil, seawater, and fresh water. Contamination of recreational waters and seawater has been associated with outbreaks of opportunistic Pseudomonas infections; however, the relative role water plays in the transmission of this bacterium to humans is still unclear. Their metabolic diversity ensures their constant and widespread presence in the environment as they are able to colonize diverse niches. Given the great interest in the genus Pseudomonas and their past application to soils as biocontrol agents to ward off potential crop pathogens many species have been mooted as potential biocontrol agents in seawater.

We used different methods to show the presence and the distribution of P. aeruginosa in seawater. The culture dependent identification of *Pseudomonas aeruginosa* generally takes more than 2-3 days. More reliable, rapid and cost effective results can be achieved with PCR in routine microbiology laboratories. The CHROMagar combined with chromogenic characteristics, enabled us to detect specific bacterial species in the environment independent of conventional culture techniques. The aim of this study was to establish a taxonomic, molecular and phenotypic framework to enable the identification of, and crucially, also the tracking of P. aeruginosa in seawater samples. Through the combined use of CHROMagar and PCR a practical, cost-effective and reliable method was developed which allowed the identification and quantification of P.aeruginosa within a reduced time period.

In total, 167 coastal seawater samples were taken from the Istanbul coastal region between January 2011 and June 2012. The samples were routinely inoculated onto CHROMagar Pseudomonas (PS820) and Pseudomonas Selective Medium. The isolates were initially classified according phenotypic characteristics and further identified by molecular methods based upon PCR and 16S rRNA sequencing. Using CHROMagar Pseudomonas media together with PCR identification shortened the time, and allowed the detection of Pseudomonas species both rapidly and accurately. The results of both of methods were in 100% concordance with each other. Pseudomonas species identifications is possible with both systems, however the identification of subspecies still requires conventionally serological typing. CHROMagar Pseudomonas will aid the routine seawater microbiology laboratory to detect Pseudomonas rapidly, with only one media, in a cost-effective and reliable manner.

Keywords: Pseudomonas, CHROMagar, PCR, Istanbul coastal area

Epidemiologic Features of Cutaneous leishmaniasis in Foum Jamâa (Azilal, Morocco)

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Cutaneous leishmaniasis (CL) in Morocco is caused by three species, *Leishmania major*, *L. tropica* and *L. infantum*. The region of Foum Jamâa (province of Azilal in the Atlas of Morocco) has become an endemic for the disease. This study reports the micro-environmental and socio-economical factors that may act as a factor of recrudescence for CL. These epidemiological assessments were conducted from risk January 2006 to December 2009 on a total of 655 patients who came from 43 localities distributed in 3 sectors in Foum Jamâa.. Among CL positives cases, free distribution tests were used to analyze the effect of each factor. No association between gender and the rate of Leishmaniasis was observed, while the highest rate of positive lesions was found in the age group of 10 years or under. The distribution of positive cases was more significantly influenced by environmental factors common to each sector (Altitude, Sewerage, Garbage, etc.) than by individual specific lifestyle (Habitat type, Lighting, Toilet, etc.). The survey yielded many recommendations to be made in planning a more accurate program of Leishmaniasis Control and many preventive actions to be undertaken to tone down the drawbacks of urbanization.

Keywords: Cutaneous leishmaniasis; Risk factor; Foum jamâa.

Molecular Exposomics: Status, Perspectives, and Challenges

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The exposome of real organisms is defined as the measure of all the exposures of an individual in a lifetime and how those exposures relate to disease (CDC 2010). Exposomics is the study of the exposome and is related to genomics, metabonomics, lipidomics, transcriptomics and proteomics. Biomarkers are targeted to determine exposure and effect. Exposomics includes the study of exposures in the environment. However, environmental exposomics has not been tackled so far although the definition can be extended to other organisms than humans (Schramm et al. 2012). Molecular exposomics does not cover all exposomic aspects such as noise, radiation, pathogens but focuses on the exposure of individuals to molecules and their effects within a lifetime. Individuals other than humans might have also advantages with respect to their observation due to their shorter lifetime or less transient exposure situation. Virtual Organisms (VO) are defined as an artificial property-tool, and are reflecting exposomic processes in compartments of real organisms. For instance VO containing fat or proteins such as albumin can be employed to investigate the exposure of chemicals against such compartments which are common for many species in the kingdom of animals. Another advantage of VO is the fact that the duration of the exposure can be well defined and does not depend on the lifetime. If we look at the kingdom of molecules, resp. chemicals, the exposure to chemicals of transient behavior is difficult to quantify. In contrast chemicals which are bioaccumulating are better and easier to be investigated in exposomics due to their long lasting presence in compartments of individuals. Especially persistent organic pollutants (POP) have properties to estimate exposure to them more accurately. POP once marketed are expected to remain in the environment and biota for a long time and might peak even years after their use in the following generations of individuals. Toxicant dependent shifts in an ecosystem might not merely be a result of a certain toxicant concentration influencing an actually present biocenosis, but interplay of the succession in the ecosystem with interference from the actual concentration at each moment. In other words, the state of an ecosystem at a specific time is a result of an over time integral of direct and indirect interactions of all parts of the ecosystem also affected by the respective substance concentration (Schramm et al. 2008). A possible solution might be to compare the effects at each moment with the integral of the concentration over time, the toxodose. Toxodose is an approach formerly used to estimate the toxic impact of military substances like poison (eg. Mustard) gas and was found to be a potentially useful tool for time-independent discussion of ecotoxic effects (Schramm et al. 2002). Thus molecular exposomics is reflecting time dependent exposure and effects of molecules with its intrinsic challenges and perspectives which are outlined besides for humans also for the environment and for VO of exposure sciences.

Keywords: Molecular Exposomics, POP, Virtual Organisms, Toxodose

Limitation of essential amino acids as an epigenetic environmental nutritional factor for health improvement; in vivo findings

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Nutritional status can be used as an epigenetic tool in improving health outcomes in animals and humans. A series of epidemiological data and in vivo studies have shown that certain nutritional practices can reduce the risk for metabolic diseases such as cardiovascular disease (CVD), type II diabetes mellitus (T2DM) and cancer among others. In this work we show that limitation of essential amino acids, namely cysteine and methionine, in the diet can alter gene expression profile and protein levels in the liver of rats and induce a pro-survival protective programming thus improving the defense mechanisms of the animals. Rats on sulfur amino acid (SAA) deficient diet exhibit induction of integrated stress response as assessed by eukaryotic initiation factor 2α (eIF2α) phosphorylation hepatic levels as well as activation of a series of pro-survival genes (ATF4, ATF3, SLC7A11, CARS, CTH) and programming. Further, modest deprivation of SAA does not suppress hepatic mTORC1 signaling but does increase total 4E-binding protein 1 (4E-BP1) levels revealing a potential mechanism for selective translation control. In separate experiments with diets varying in their SAA content we showed that deficiency of protein leads to increase in levels of total 4E-BP1 in the liver of rats while more imbalanced diets seem to induce 4E-BP1 levels even at similar feed intake compared to less imbalanced ones. Finally, hepatic eIF2α-P/total ratio did not change in energy or protein restricted animals, hence the observed induction of 4E-BP1 does not seem to be General Control Nonderepressible Kinase 2 (GCN2) dependent. More research is necessary to establish the optimum levels of limitation that exert the desirable optimized activation of pro-survival programming and conditioning.

Keywords: ATF4, eIF2α, General Control Nonderepressible Kinase 2, Sulfur amino acids, 4E-BP1

Heat stress conditions in the Greek territory within the warm period of the year

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Human thermal comfort sensation is defined as the conditions in which human expresses satisfaction with the thermal environment, absence of thermal discomfort, or conditions in which a great percentage of the population (more than 80%) do not express dissatisfaction. The assessment of these conditions can be accomplished by the application of a large number of theoretical and empirical indices estimated using meteorological parameters such as air temperature, wind speed, air humidity, solar irradiance, etc. The aim of this work is to investigate the heat stress sensation by humans in 30 different sites within Greece for the period 2005-2009. For that purpose, one of the widely used thermal index, known as the Heat Index (HI), adopted by the USA's National Weather Service, is calculated. HI is an index that is sometimes referred to as the "apparent Temperature". The HI is a measure of how hot it feels someone when relative humidity (RH) is added to the actual air temperature. For the estimation of HII values, hourly values of air temperature (oC) and relative humidity (%) were used. The aforementioned meteorological data have been recorded by the network of meteorological stations of the Hellenic National Meteorological Service (HNMS). Results indicate a great variability of heat stress conditions, at the same time in different regions across Greece, within the warm (April-September) season of the year. Furthermore, it seems that the height above sea level, geographical coordinates and the distance from the sea plays an important role in the establishment of asychronous heat stress conditions.

Finally, the findings of this work are useful in the study of bioclimatic architecture and energy needs within the Greek area.

Keywords: Human thermal comfort-discomfort, bioclimatology, Greece

Characterization of nutritional and antioxidant status of Chemlali adult olive tree grown in a fluoride polluted zone in an arid region in the south of Tunisia

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Thirty- year old- olive tree (Olea europaea L. cv. Chemlali) growing in the vicinity of a phosphate fertiliser manufacturing plant near Sfax-Tunisia were used to determine (i) the different steps of fluoride accumulation in this species exposed to air fluoride pollution under arid climatic conditions of the south of Tunisia, and (ii) so the tolerant mechanisms adopted by this species still surviving in such restrictive conditions with respect to the antioxidant defense system. Results of this study showed that fluoride accumulation in leaf tissues displayed three phases. The first one is called "an accumulation phase" during which the leaf fluoride contend tend to increase until reaching a maximum. The accumulation phase occurred in coincidence with the active vegetative growth phase of the olive tree. The second phase is called a "compartimentation phase of fluoride in leaf necrosis". This phase was characterized by a reduction in leaf fluoride content. This diminution was accompanied by the appearance of leaf necrosis at the marginal parts of the leaves with fluoride content at the central part of necrosis leaves similar the that of control plants. The third phase is called "a stable phase" along which the leaf fluoride content was almost similar along the time. This stability could be explained by a dynamic stability between the fluoride content in the environment air and the damaged leaves. On the other hand, the accumulation of leaf fluoride content during the first phase was accompanied with those of calcium and magnesium contents, and this pattern varied among the different growth phases. In parallel, the malondialdehyde content (MDA) in polluted leaves showed a significant increase during the first phase, in comparison to control ones (located at 40 km far from the factory); and this accumulation decreased with the decrease and stability of leaf fluoride content. The increase of MDA content was accompanied with that of catalase (CAT) and APX activities and the decrease of the superoxyde dismutase (SOD) and polyphenol oxidase (PPO) activities. In fact, the decrease of SOD activity and the increase of CAT activity were at 68 and 55 %, respectively, in comparison to the control ones. The higher increment rate of CAT and APX activities were recorded along the stabilizing phase. For both compounds, this increase in polluted olive tissues was at more than two times higher then the control ones. These results suggest a strong correlation among the vegetative growth phase of the olive tree and its nutritional status and antioxidant enzymes activities. Such pattern could explain the tolerance mechanisms developed by the olive tree in order to maintain its evergreen landscape under polluted conditions of arid region in Tunisia.

Keywords: Air pollution, catalase activity, fluor, Olea europaea L., superoxide dismutase, polyphenol oxidase, ascorbate peroxydase

MESAEP
Mediterranean Scientific Association
of Environmental Protection

Is exogenous proline supplement suitable for improving olive tolerance to NaCl salinity: a comparative study of antioxidant defense system of two young olive cultivars grown under arid climate in Tunisia?

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The effects of exogenous proline supplement on activities of some antioxidative enzymes were investigated in two-year-old olive cultivars (*Olea europaea* L. cvs. Chetoui and Koroneiki) subjected to different NaCl salinity levels. The most outstanding effect of exogenous application of proline on olive plants was an increase of activities of superoxide dismutase (SOD), catalase (CAT) and ascorbate peroxidase (APX). The polyphenol oxidase (PPO) was the only enzyme clearly down regulated by the addition of proline in both olive cultivars. Furthermore, under the different treatments, Koroneiki showed better antioxidative enzymes activities, and thus better protection against oxidative stress. Nevertheless, the extent to which the antioxidative enzymes activities increased in the presence of proline depend on the proline medium levels (25 or 50 mM proline). The higher the proline medium was, the better the antioxidant system was. These results show that the ability of olive trees to up-regulate the enzymatic antioxidative system might be an important attribute linked to salt tolerance. Based on these findings, it was also observed a strong relationship among proline accumulation and antioxidative defense system. In other terms, the association of higher proline accumulation and antioxidative enzymes activities could be effective in a water-limited environment and may be useful selection criteria in breeding programs with the objective of improving salt tolerance and growth of olive trees.

Keywords: Antioxidant enzymes, proline accumulation, NaCl salinity, *Olea europaea* L.;

Desert dust and public health

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Each and every synoptic scale cyclonic depression over the Mediterranean basin has the capability of transport desert dust to long distances. Central and Eastern Mediterranean are more prone to dust transport compared to Western Basin. It is further known that during the long range transport only small fractions i.e., less than 10 micron size dominates the dust veil. Being so small they can interfere with our respiratory system and can easily find ways to penetrate deep into respiratory system through inhalation. It is known that upon contact with water the organic fraction of desert dust becomes active and releases oxalate as an osmosolute. Under atmospheric conditions it has been shown that oxalate attaches them onto the clay mineral surface and forms iron oxalate and through decarboxylation reaction the formation of reduced iron ($Fe2+$), some essential trace elements and various basic amino acids enhances the atmospheric water. It has further being shown that Saharan dust-containing atmospheric conditions trigger the trigeminovascular system. Whereas Co60 gamma ray-treated Saharan dust (sterilized) and (iii) dust-free air cannot induce such adverse conditions. It has clearly been shown that the number of c-fos+ neurons in superficial lamina of TNC was significantly higher in the Saharan dust group (32.9 _ 5.3, P = 0.0001) compared with dust-free air (11.02 _ 2.7) or Co60-treated Saharan dust groups (15.01 _ 2.4). Another survey that based on the air quality measurements, precipitation data and number of patients applying hospitals having respiratory problems further revealed the fact that the number of patients correlates with the air quality deterioration associated with dust transport events. Thus it's possible to suggest that public health does affected by Saharan dust and this correlation is in fact not due to clay minerals composition but rather than to its organic composition.

Keywords: Saharan dust, public health

The toxicological Effects of fertilizer NPK in the health of workers in the petrochemical complex Fertial

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The study of the health effects associated with chronic exposure to low doses of chemical agents in the workplace is still complicated by the lack of available exposure data quality and representative of the entire population interest

The scarcity of studies on the effects of fertilizers on human health, we focused on the study of risk associated with the handling of fertilizers at the unity of NPK to determine the possible effects of these product health workers.

In order to evaluate, the effects of the toxicity of these products, a study was conducted on 34 employees of a complex storage and distribution of agricultural fertilizers Fertial, mainly exposed to nitrate derivatives. A questionnaire was prepared and distributed to all workers in the unit including even those that were redirected to other units. The group of workers was divided groups according to age of the workers. A blood is reveled during the medical visit; several parameters were study.

The preliminary results of the questionnaire have detected infertility problems, deafness and lung irritation in the majority of unit employees. Although the results of biochemical and hematological parameters of employees did not show any toxicity in this complex, several disturbances have been reported. In conclusion, our results showed that:The organism can adapt to low doses of nitrates for a long time, this was observed in workers exposed to different nitrate derivatives

Keywords: NPK fertilizer, human, toxicity, hematological and biochemical's parameters

The harmful effects of lead on the reproduction and some physiological parameters in workers manufacturing of accumulators

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During last decades, the possible effects of the environment on our health became a major concern of our companies and an active field of research. The study of the consequences of the exposure to lead on the fertility was the object of many studies as well in the animal as at the human one. To date, the results at the human are quite contrasting proposing, for certain authors, a reduction in fertilizability (attested by a lengthening of the necessary time to conceive), a deterioration of certain spermatic parameters and an attack of the integrity of the DNA of the spermatozoids. This study aims at evaluating the effect of the metal element-trace; lead, on the sex hormones in male workers, exposed to this metal on the level of the manufacturing plant of lead accumulators. The results indicate a significant reduction of the testosterone concentration in exposed workers compared to the control. However, the rate of LH was strongly increased at the individuals exposed to Pb. A significant difference concerning the rate of FSH, the hormone Prolactin and cortisol was recorded. The physiological parameters were also analyzed. An increase in the blood (Pbs) was recorded, it ranges between (286 - 796). The concentration of the acid amino-levulinic delta urinary (ALAU) exceeds the higher limit of the standard which reaches a rate of 17.2 mg/100 ml. The protoporphyrin-zinc (PPZ) is remarkable and reaches a maximum rate of 554 mg/100 ml in some workers.

Conclusion

The Pb Pollution in this workplace caused hormonal disturbances of the axis of the reproduction, and also cortisol, indicating that the workers are under the stress of pollution by this metal.

Keywords: ALAU, FSH, LH, Prolactin, Cortisol, Testosterone, Pbs, PPZ.

Levels and temporal trends of organochlorine compounds in marine organisms from Greek waters

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Organochlorine compounds, including the DDT group and the polychlorinated biphenyls (PCBs) are persistent environmental contaminants with a high capability for bioaccumulation in the fatty tissues of marine organisms through the food chain. The aim of this work, performed in the framework of the MED-POL program was to study the levels and the temporal trends of DDTs and PCBs in two edible fish species belonging to different ecotypes (the demersal red mullets Mullus barbatus and the pelagic bogues Boops boops) and collected from eight marine locations in Greece during the period 1986-2010.

The analytical method used included freeze drying of the fish flesh, Soxhlet extraction with a mixture of hexane-dichloromethane, clean-up and fractionation on an alumina column and determination by ECD gas chromatography.

In all the samples the organochlorine concentrations were quite low compared with those found in other Mediterranean regions and never exceeded human health limits. The highest values of DDTs and PCBs were found in the red mullet (mean DDTs values: 11.6 ng/g in the red mullets and 2.4 ng/g in the bogues, mean PCBs values: 5.5 ng/g in the red mullet and 2.5 ng/g in the bogues). These differences are probably attributed to the higher lipid content of the red mullets (1.5 % in the bogues, 3.3 % in the red mullets) and/or to the different feeding conditions of the two species. After normalization of the results to the fat content, no differentiation between the two species was observed for the PCBs (mean PCBs values: 251 ng/g fat in red mullets and 263 ng/g in bogues), but the DDTs concentrations continued to be significantly higher in the red mullets (mean DDTs values: 473 ng/g fat in the red mullets and 228 ng/g fat in the bogues). This preferential bioaccumulation of DDTs in the red mullets might be related to the different dietary intake of these sea bottom feeders.

The spatial distribution of DDTs and PCBs was generally homogeneous for both fish species and only in fishes collected from Saronikos gulf higher PCBs values were recorded, probably attributed to inputs from the industrial activities in the greater area of Athens.

Although a decreasing temporal trend for DDTs during the twenty five years of the survey was found, PCBs levels seems to remain constant, especially in red mullets, during these years, probably suggesting continuous PCBs inputs into the marine environment, despite the banning of these compounds. The ratio PCBs/DDTs takes its greatest values in the bogues (mean value: 1.2 in bogues, 0.7 in red mullet), further evidencing the different behaviour of the two fish species in relation to their ability to biomagnify the organic pollutants.

The most abundant compound of the DDT family was always the main DDT metabolite p,p'-DDE, in percentages above 80%, suggesting no recent inputs of DDTs in the areas studied. The predominant PCB congeners were the hexachlobiphenyls 151 and 138, in accordance with the common congener distribution pattern encountered in marine organisms.

Keywords: Bioaccumulation, organochlorines, marine environment

Analysis of volatile organic compounds in exhaled breath of normal subjects

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Normal human alveolar breath is a complex matrix with thousands of molecules that constitute breath print that carries information about us (similar to a fingerprint) and certain information about our state of health. The modern era of breath analysis commenced with the pioneer work of Pauling et al 1971. They observed around 250 different volatile organic compounds (VOC) in the sample but did not report chemical identification of individual compounds. Human alveolar breath contains a large number of volatile organic compounds derived from the blood by passive diffusion across the pulmonary alveolar membrane. In addition to carbon dioxide and oxygen exhaled breath contains large number of volatile organic compounds. Exhaled breath also carries aerosolized droplets that contains nonvolatile compounds, called exhaled breath condensate. The field of breath analysis is rapidly evolving as the new frontier in medical testing, because relatively rapid and noninvasive method of detection of diseases. Changed leveles and composition of VOCs in diseased patients can provide insight into abnormal metabolism. Typical VOC present in human breath are isoprene, methanol, acetone, 2 propanol, as well as limonene (exogenous origin), hydrogen (from bacteria in the gut of some persons suffering from fructose malabsorption), methane, ethane and penthane (as lipid peroxidation products). Acetonitrile, furan and 2 methyl furan have been found in smokers. Possible sources of cancer VOCs have been reported. It has been proposed that cytochrome p450 enzymes are overactivated in lung and breast cancer. Newer reports postulate that patients with colorectal cancer have different volatile organic compounds in breath. Breath analysis has potential to fields beyond medicine including environmental monitoring, security and other. VOCs in 1l of alveolar breath were collected using Bio-VOC breath sampler (C-BIO01). Then, samples were transferred on adsorbents with combination of Carbopack C/Carbopack B/Carbosieve S111 which facilitates adsorption of the widest range of Cn, that are appropriate to thermal desorber. Samples were analyzed using GC/FID/ECD (Agilent 7890) associated with the thermal desorber (Unity MARKES 1). Separation of the components was performed on a capillary column DB-624, 60 m length. GC/FID/ECD was, previously calibrated with 66 compounds. Alveolar breath was collected from 49 younger subjects (around 20 years old), and 52 older subjects (over 40 years old). In younger population predominant VOCs are 1-Etil-4-metilbenzen, 1,2,4-Trimetilbenzen and 1,3,5-Trimetilbenzen, present in over 50 percent of volunteers. With the smallest ferquency of occurence are represented propilen, 1,3-Butadien, izopropil alkohol,vinilacetat and toluen (less than 10% of subjects). In population of volunteers over 40 years, predominant compunds in alveolar breath are etilbenzen, 1-Etil-4-metilbenzen, 1,2,4-Trimetilbenzen and 1,3,5-Trimetilbenzen found in over 50 percent of subjects. In population of older subjects with smalest occurence were 1,3-Butadien,vinil acetat, 2-butanon, etil acetat, tetra hidro furan. In breath of both groups were found chlorinated compounds as well.

Keywords: Volatile organic compounds, breath,biomarkers, environmental health

Removal of Cobalt ions onto Algerian clay. Characterization, equilibrium and kinetic studies

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The removal of cobalt ions from aqueous solutions onto Algerian clay was investigated in batch. The clay samples were characterized by X-ray powder diffraction, Infrared spectroscopy, Scanning electronic microscopy, Differential thermal and gravimetric analysis and Nitrogen adsorption technique for specific area surface and porous volume. The effects of parameters as initial concentration, pH, solid-liquid ratio (S/L) and temperature were studied. The Freundlich and the Langmuir models have been applied and the adsorption equilibrium has been found to follow the Langmuir model. Kinetic studies showed that the second-order sorption model was the most prevalent for the adsorption of cobalt ions. The rate constant of the exchanged ions appears to be controlled by chemical sorption process. The thermodynamic parameters namely the enthalpy $\Delta H°$, entropy $\Delta S°$ and free energy $\Delta G°$ of adsorption of Co^{2+} ions on Algerian clay were determined.

Keywords: Cobalt; Algerian clay; Characterization; Removal; Environment.

Valorization of *Ulva lactuca* biomass types in the recovery of chromium (VI) ions

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The environmental pollution by heavy metals is a major environmental problem that takes a dimension increasingly alarming due to industrialization and the development of various human activities, hence the need for disposal. To do this, several decontamination processes have been developed to eliminate these toxic pollutants. Most of these technologies are expensive consequently the adsorption technique on biological materials is an important alternative technique in the treatment of effluents through its effectiveness and low cost and is most commonly used for the removal of heavy metal ions.

This work involves the use of macro seaweed as *Ulva lactuca* for the recovery of Cr (VI) ions from aqueous solutions. The *Ulva lactuca* crude is from the region of Tipaza northern coast of Algeria. The alga was harvested on the beach in Ain Tagouarait (36 ° 35 '25.06" of latitude North, 2 ° 31' 9" of longitude) characterized by bedrock.

The biosorbent was characterized by different techniques, XRD, SEM, DTA, TG and FTIR. The effects of various parameters such as initial concentration of ions Cr (VI), the exchange temperature, the pH of the solution and the solid / liquid ratio were studied. According to the results, a fixation rate of about 75% was recorded. The results of adsorption kinetics show that equilibrium is reached in relation to 90 min. The study of the adsorption isotherms of ions of Cr (VI) on Ulva lactuca crude was performed using models of Langmuir and Freundlich. The thermodynamic parameters were determined.

Keywords: Alga, *Ulva lactuca*, chromium (VI) adsorption, kinetics, isothermal characterization.

The modulator role of diethyldithiocarbamate in radiation-induced biological hazards

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The objective of this study was to elucidate the role of diethyldithiocarbamate (DEDC) in gamma radiation-induced oxidative damage and DNA fragmentation. Male albino rats were whole body exposed to 1 Gy three times/week up to 6 Gy. DEDC (100mg/kg body weight) was administered to rats 30 minutes before exposure to each dose. The results revealed that whole body gamma irradiation of rats induced a significant decrease of superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GSH-Px), glutathione reductase (GR), and glutathione-S-transferase (GST) activities and glutathione (GSH) content in the blood, brain and liver tissues. In addition, a significant decrease was recorded in the activity of paraoxonase (PON), arylesterase (AE), and carboxylesterase (CE). The decrease in the activity of antioxidant enzymes was associated with a significant increase in the level of malondialdehyde (MDA). Comet assay and estimation of DNA fragmentation in the blood indicated DNA damage. Administration of DEDC has significantly improved the antioxidant status of the blood, brain and liver tissues of irradiated rats and diminished DNA damage. It could be concluded that DEDC might modulate radiation-induced oxidative stress and DNA damage through scavenging free radicals and enhancing the antioxidant system.

Keywords: Blood, liver, brain, gamma irradiation, diethyldithiocarbamate.

Effects of xenobiotics on thyroid stimulating hormone (TSH) activity and synthesis

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Man-made chemicals, dietary components and other external stress factors can have long-lasting effects on various systems of the human body such as the endocrine system, including hormones secreted by the thyroid gland which regulate human development and metabolism. Thyroid-disrupting chemicals (TDCs) alter the circulating serum levels of T3 and T4 hormones and thyroid-stimulating hormone (TSH) in vivo. The aim of this study is to explore the chemical disruption of TSH activity and synthesis using in vitro methods. The effects of various TDCs are tested on their capacity to disrupt the synthesis and activity of TSH. FRTL-5, a rat follicular thyroid cell line and Nthy-ori3-1, a human follicular thyroid cell line, are tested for their proliferative response to TSH and the potential effects of chemical exposure to cell proliferation and TSH activity in vitro by using the recently developed TSH-Screen assay. MOLT-4, a human lymphoblastic leukaemia cell line, is tested for its TRH-induced TSH synthesis capacity. The TSH-Screen results using FRTL-5 cells suggest a cytotoxic effect for bisphenol F and 4,4'-butylidenebis at the highest tested concentrations in vitro, whereas incubation with amitrole induces a slight increase in FRTL-5 cell proliferation. Cell culture of FRTL-5 cells with 500 nM and 1 μM NaI respectively, does not show any profound effect on the overall proliferative response of FRTL-5 cells to TSH. MOLT-4 TRH-induced TSH synthesis is successful reaching almost 2.5 μIU/mL. All together the results of the present study suggest that the TSH-Screen is a quick and reliable in vitro bioassay for testing potential TDCs. The FRTL-5 cell line is a well-established cell line for the TSH-mediated activity and the MOLT-4 cells respond positively to TRH, producing detectable levels of TSH in vitro.

Keywords: Thyroid disruption, thyroid gland, thyrotropin activity and synthesis, in vitro bioassays

Effect of environmental factors on the hearing of children and adults

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Environmental factors such as meningitis, typhoid fever, and other bacterial and viral infections are major causes of hearing loss in children and adults.

In a sample of 210 people with hearing loss 44.3%, 93 cases observed 54cas which are female and 39 cases were male, were involved as environmental factors, the study of the causes of deafness occurred in function age shows that the difference between the age groups is significant, 11.9% of postnatal acquired deafness are due to typhoid fever and is seen in patients aged 11 and over bacterial meningitis and hyperthermia are major causes of acquired deafness in children under 10 years with 3.8% and 8.1% respectively chronic otitis remains last in against noise and trauma are major causes of deafness in adults from 30 years with 1.9% and 3.3% respectively; presbycusis and chronic ear infections are the major causes of hearing loss among people aged 60 and over and are still evolving deafness with 4.8 and 10%, respectively, 5%.

Keywords: Environment factor,hearing, meningitis,typhoid

Use of third generation ionic solvents as "green" media for biocatalytic processes

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Ionic liquids (ILs), also called molten salts are mixtures of cations and anions that melt below 100oC and have received a considerable attention over the last decade as an environmentally friendly alternative to organic solvents. Due to their interesting physical and chemical properties such as negligible vapor pressure, ability to dissolve various hydrophobic/hydrophilic compounds and excellent chemical and thermal stability they have been widely used as "green" media for biocatalytic processes. Since they started to attract interest in the 1960s the types of ILs extended to include new generations with more specific and environmental friendly properties. Recently a third generation of ILs is emerging with structures comprising biodegradable and readily available with lower toxicity ions such as natural bases, amino acids, sugars and naturally occurring carboxylic acids. Another recently discovered and promising category of solvents constitute deep eutectic solvents (DES). DES are physical mixtures of salts such as choline chloride and uncharged hydrogen bond donors such as urea or glycerol. Due to their simplicity in preparation and their inexpensive and biodegradable components, DES represent an attractive alternative to organic solvents for enzyme-catalyzed reactions [1, 2]. In the present study, we have synthesized four potential biodegradable hydroxyl ammonium ILs and various choline chloride and ethyl ammonium chloride based DES in order to investigate the activity and stability of redox enzymes such as cytochrome c from equine heart and horse radish peroxidase in aqueous solutions of ILs and DES. We investigated the effect of various reaction parameters that affect the structure and the catalytic behavior of enzymes in theses environmentally friendly reaction media.

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Keywords: Ionic solvents, redox enzymes, "green" bioprocesses

Evaluation of the performance of an automated cell counting pipette versus Trypan blue exclusion

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A better understanding of environmental factors influencing human health will benefit from the availability of fast and reliable methods allowing the quasi simultaneous measurement of a panel of endpoints in cell exposure studies. Automated cell-counting methods are basic for this purpose if comparability with traditional manual cell counting procedure is provided.

In the present paper, both dead and viable cells of human lung adenocarcinoma epithelial cell line (A549) and human bronchial epithelial cell line (16HBE 14o-) are counted by both an hemocytometric method (using Trypan blue dye) and a handheld automated cell counter based on the Coulter principle (Scepter 2.0, Millipore). Correlation indexes higher than 0.998 have been obtained using both cell counting protocols in all cases, thus confirming the reliable use of automated cell counters whenever fast, easy to use, precise cell counting is a requisite.

Keywords: Cell counting, comparison, pulmonary cell lines

Formation and Analysis of Welding Fume in Pipe-Line Welding and Its Effect on Worker's Health and Environment

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Pipe-lines are built in order to transfer oil and gas to long distances and they are quite crucial in today's world with ever growing energy need. Welding is the primary joining technique for pipe-lines and covered electrodes are widely used in this respect. In this study, pipe steel has been welded using variety of electrical parameters with different cellulosic covered electrodes. Glass fiber filters have been used in order to acquire fume formation rate data and cellulose fiber filters have been analyzed for composition and morphology of fume. In addition, results have been evaluated in terms of occupational health and safety as well as environmental effects.

Keywords: Pipe-line, welding, cellulosic electrode, fume, occupational health, environment

Investigation of Pollution from Welding Fume and Worker Exposure in Turkish Shipyards

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Sea vessels are the backbone of one country's overseas trade and naval forces. Shipbuilding and ship repair industries employ new technologies when manufacturing tanker, cargo and passenger vessels including the cruise vessels. Many different manufacturing processes employed in shipbuilding and repairing require a vast amount of material inputs and generate large amounts of waste and considerable emissions. The effect of these contaminants on workers' health is as important as their environmental effects. There are several kinds of welding methods used in shipyards. In shipbuilding, the most common technique is electrical arc welding. The fume emissions caused by welding electrodes are one of the most important pollutant sources in shipyards. The effect of manufacturing processes in shipyards on environment and human health can be reduced with technological improvements. Local and international authorities should support new technology manufacturing methods to achieve high quality and environmental friendly shipbuilding and improvements in emission minimization with strictly defined standards. These improvements and standards will make it possible for shipyards to take necessary actions for their environmental compliances and automate their processes for manufacturing to achieve environmental friendly, i.e. green, shipyards. In this study, welding of shipbuilding steel materials with different basic covered electrodes using variety of electrical parameters has been realized. Fume formation rates of these experiments have been measured and the fumes exhaled have been analyzed for composition and morphology. Results have been evaluated in terms of worker's health and environmental friendliness.

Keywords: Shipbuilding, welding, basic electrodes, worker's health, pollution

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Noise exposure and health in population in Italy

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BACKGROUND: High levels of noise exposure has been associated with several health effects. Airports have increased the number of flights, especially in summer time with the consequences that nearby residents are exposed to an increase in noise levels and potential disturbances and health disorders.

OBJECTIVE: To estimate the level of exposure to noise around six airports in Italy (Rome-Ciampino; Milan-Linate and Malpensa; Pisa, Turin, Venice) and evaluate, on residents nearby, the health impact on hypertension, annoyance, and high sleep disturbance (HSD).

METHODS: residents in the local municipalities, aged over 40 years, were enrolled in the study at 31/12/2010 and included in four group of exposure to noise of aircraft and /or traffic and a control group. The aircraft noise exposure was defined using the Integrated Noise Model linked to each geocoded participant's address and Lden (<55, 55-59, 60-64, 65-70, 70-75 dB), Lnight, Leq (day and night) were calculated.

RESULTS: Collection of data ended in march 2013 and analyses is still on going. 687.147 persons were recruited, 125.621 (18.3%) of whom exposed to aircraft noise levels >55dB. There were 101.528 (14.8%) subjects exposed to 55-60 dB, 22.016 (3.2%) to 60-65 dB, 1.890 (0.28%) to 65-70 dB, and 188 (0.03%) to 70-75 dB.

Using the concentration-response functions (Methodological guidance for estimating the burden of disease from environmental noise WHO 2012) we estimated that exposure to noise levels above 55 dB could be responsible each year of 1.577 (1.25%) additional cases of hypertension, 11.572 (9.21%) cases of annoyance, and 10.101 (8.04%) cases of HSD.

CONCLUSIONS: The effects of noise, especially on residents near airports are far from negligible. The Italian SERA study will provide indications on potential health effects from high levels of noise exposure.

Keywords: Noise pollution, environmental health, SERA study

Development of urban transformation in Turkey, case study: Ayazma application project

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By reason of disequilibrium between internal dinamics such as industrialization and external dinamics such as globalization which are efficient on developmant of urbans has exposed chaos and this chaos has caused to come into existence of differnt identities in big cities.Change on economical, social and political area chronically affects the urban life.Also planning in changing urban dinamics should be again analyzed.
During the application process of the urban transformation phenomenon which has a multidimensional content, a project produced by considering humans, the natural structure, and the historical development of the locality should be evaluated by considering it's identity, innovator approach, economic, social, and ecological constituents. It is a fact that a model without participants cannot be carried out. In the urban transformation process, it is important not only to take role as decision makers and applicators such as public governments, private sectors and professionals but also to ensure the participation of the users to result with success.
After various experiences gained in developed countries a conceptual framework composed that explains how urban renewal should be. Both implementations and regulatory framework is still in the air because Turkey is in the early stages of urban renewal experience. Laws in force are insufficient on behalf of developing successful urban renewal strategies and urban renewal is just discussing with physical dimension.
At this piont, renewal of areas that into break into urban has appeared as problem.According to that, notion of urban transformation and prepaered urban transformation project have came to order.
In this conteksts firstly,it has been asserted on fundamental conception and featured general knowleg.Primarily, defination of transormation and transition have been explaind and notion of globalization which is one of the important factor of urban tranformation has been discribed. After expalnation and discribtion of basic notion, it has beeen asserted aims of urban transformation, methods of urban transformation and damations of urban transformation.It has been analyzed which way it was discussed social, economical, planning-design, specially executive and legal dimensions of transformations in Turkey.
Secondly, development of implementing of urban transformation and urban planning scheme in Turkey heve been explicated.

In this contects, danamics of urban transformation and process of setting the new rezidance area have been approached.

Historical development of urban transformation and process of urban tranformation in europe have been analyzed and compare to our countries implementing.In consequence, it has been issued to desing causal and rhigt-wrong connection.

Finnally, it has been worked on current and complited Küçükçekmece Ayazma-Tepeüstü Urban Transformation impelementing project, to understan notion of urban transformation and explicate the process of implementing, dinamics of transformation and dimantions.The process of urban transformation in Turkey has been expressedwhit all kinds of steps.

Keywords: Urban transformation, urban, European side of Istanbul

Environmental policy and education

Water resources in the Middle East: Proposals for sustainable development of the region

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The Middle East is characterised by seasonal aridity everywhere and intense aridity throughout most of the southern part of the region. Almost all the areas receive precipitation during the winter months. The amounts are greatest in the northern parts of the region. Much of this precipitation is locked in the mountains as snow and is not released into the river systems until the spring snow melt. These rivers then transport the waters downstream into environments which are often extremely arid. So about 89 % and 51 % of the major rivers, Euphrates and Tigris, flows respectively are generated within Turkey.

These major river water resources of the Middle East are jointly shared among Turkey, Syria, Iraq and Iran (they are further essential for Lebanon, Jordan and Israel). Adequate supplies of good quality water are an essential element for the survival, economic welfare and prosperity of these countries. But as unused water resources became less and less, then water for one user means lack of water for the other, has in recent years led to competition over these resources and in certain cases to conflicts and even to mobilisation of armed forces.

It is the growing pressure on these water resources which has caused the difficulties which are observed at the present day. The greatest single pressure has been caused by the very rapid growth of population. At the same time, as a result of dependence agriculture due lack of industry, 80% of water use in most Middle East countries is for irrigation purposes. On the other hand in conditions of growing water scarcity it is no longer feasible to go on subsiding agricultural production by making available cheap irrigation water. To try to make more water available, often at very high cost, becomes with time less and less feasible. An alternative approach is "demand management" needs a wealthy urban population.

Under these aspects now it exist a serious conflict between the riparian states of the mentioned river basins concerning the allocation. So long this problem remains unsolved the political stability in the region is and remains under threat.

The aim of this paper is to demonstrate the existing situation in the Euphrates-Tigris river basins and to focus on the conflict points between the states involved. The possible solutions will also be discussed in detail.

Keywords: Middle East, Turkey, Syria, Iraq, water footprint, Euphrat, Tigris

Coastal Pollution and Sea Water Preservation: An Evaluation of Educational Effectiveness Using Fuzzy Logic Modelling

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Istanbul's coastline is used recreationally during the summer and for fishing throughout the year. Frequent use of sea water not only disrupts water quality but also increases risks factors that can endanger personal health. One's value of their personal health, regarding the sea water quality after recreational and fishing activities are conducted, may be related to what people know about environmental protection. Lack of knowledge of environmental protection may be the result of insufficient education on the matter and the lack of availability and access to recent and updated educational materials that are made available to the public. The purpose of this study was to examine the levels of public awareness pertaining to environmental protection using fuzzy logic algorithms. A survey, developed specifically for this study, was administered to 10 different academic institutions where four different age groups were examined: 7-12, 13-17, 18-25, 26+ yrs. These groups were selected according to their age and their level of education. An initial evaluation of the participants suggested that a knowledge and information gap concerning shore and environmental awareness existed. All participants were provided with training in environmental awareness. In addition, international standardized tests were administered after the training and the results were evaluated via fuzzy based algorithms. Findings also indicate that upon providing the proper education, increased awareness occurs and this may lead to better preservation of the waters and its inhabitants.

Keywords: Fuzzy logic, Environmental awareness, Education, Environmental protection.

Spatial Multi-Criteria Decision Analysis: A Spatial Approach for Newly Introduced Routes

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Within this study, effects of the current transportation network on land use were detected and future scenarios were simulated via spatial-temporal analysis in order to aid policy makers while introducing new roads. The possible adverse affects on environment of alternative routes was stressed, to aid efforts of sustainable development. The prosed frame-work detects violations, especially environment relevant, and introduces set of rules to avoid such problems in the future. The main methodology applied was remote sensing, spatial data modelling and quantitative analyses. By using multi-criteria analyses for the newly introduced road, various alternatives were simulated and future scenarios were presented to the decision makers. The approach was tested on a connection highway to the planned third bridge, where impacts to environment, water sheds and land/use are highly controversial. Within the study area, two bridges were constituted at different time intervals and a third one is planned to be build. By means of remote sensing land-cover changes was detected for constitutive 10 years. Within a selected band along the first and second bridge; land use information, before-after construction, was detected. This information was supported by population and GDP information within this band. This helps to detect the pattern with the area, therefore, for the third bridge, a simulation for alternatives and future pattern of the area is possible. During this study, it was examined that the second bridge is passing through the most important watershed of the Istanbul Metropolitan Area at the Asian side. The proposed model detects such violations, tailor the alternative route accordingly. These rules are user-based, where it is possible to modify them or introduce new set of rules to avoid such problems in the future. The presented alternatives were discussed and achieved results were very promising. By means of the briefly presented approach and using spatial based multi-criteria analyses, a common, more discussed, agreed and transparent decisions are possible.

Keywords: Multi Criteria Decision Analysis, Road Network, Land Use, Sustainable Development,

Assessment of policies to reduce greenhouse gas emissions and air pollution in Mediterranean EU countries

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Policies that aim at reducing greenhouse gases in transport will in most cases at the same time reduce the emissions of air pollutants and thus reduce environmental health impacts. Thus taking account of as well greenhouse gas reduction as reduction of environmental health impacts is necessary for carrying out an integrated assessment and will in many cases lead to an improved efficiency of the policy due to higher benefits. Thus an integrated assessment for policies to reduce grenhouse gases and air pollution in the transport sector will be carried out using the integrated environmental impact program system ECOSENSE. Policies for road, air and ship transport for application in Spain, Italy and Greece will be chosen and assessed. Greenhouse gas emissions will be assessed by using marginal avopidance costs for reaching the long term climate protection aims of the EU. For estimating the avoided health effects, the 'impact pathway approach' will be used. The emission reduction lead to reduction in concetration and exposure; using exposure -response relationships the resulting avoided health impacts are then estimated. Polcies are then ranked according to their averall effectiveness.

Keywords: Climate policy, air pollution control, integrated assessment

Impact of the Rapid Urbanization to the Morphology of Historical Istanbul

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The urbanization of the city of Istanbul, one of the world's leading metropolises today with 14 million inhabitants, has roots going back to 6500BC in the history. Although, the city has been an attractive magnet through centuries due to its geographical location, the population has accelerated and rapidly increased since 1930s. While the population of the city was estimated around 750.000 in 1935, only in less than 20 years it reached to a million of habitants. According to the national address based census records, only in last year 2012, the city increased over 220.000 inhabitants. Significant developments in urban infrastructure and generation of built up areas with along rapid constructions have been in progress since 1950s. However, with the technological advancement in the construction systems, the need of the replacement of the existing old building stocks, the city is in another phase of change. Lack of appropriate plans or plans that have not envisioned projecting such an increment, inadequate enforcement of the plans through years due to political matters brought difficulties to sustain the future of this precious city. Within the light of this unpredicted change, one of the key challenges is to understand the results occurred to the activities in the past, significant urban infrastructural changes and their effects for the historical and cultural environment of the city. In this study, we used maps and aerial images starting from the second half of the past century and analyzed the change detection of city morphology with GIS. In order to evaluate the effects of the social infrastructures to the historical districts within time, we have selected one of the oldest parts of the city called "Üsküdar". This study aims to provide a variety of examples and approaches that have changed the current image of city in order to predict the result of today's changes by focusing on the existing impact of the recent to historical areas.

Keywords: Historical areas, environmental change, urbanization, social infrastructure

Designing a Parcel-based Query System for Reservoir Watersheds of Istanbul, Turkey

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Istanbul is one of the most crowded metropolitan areas of the World with an approximate population of 13 million. Fresh water is supplied to this megacity from seven reservoirs located on both the European and the Asian sides. Thus, protection of water resources is extremely important. Due to increase in water demand and to protect the existing water resources from pollution, it is necessary to hinder and almost stop any human activities such as construction works at the watersheds of these reservoirs. In this study, a web-based GIS system has been designed which allows to make queries by the property owners to get basic information about the status of their parcel. This system is designed to support the works of Istanbul Water and Sewerage Administration (ISKI). Using this system, the usage or construction-right and more spatial information of the parcels which are located in the protection zones of the reservoirs can be queried easily. The first version of the developed system has been activated by ISKI in 2008 and the last version has been completed in 2010. The developed web-based system has been visited by nearly 159,000 people and around 500,000 parcels were queried. In the year of 2011 this number has been doubled.

Keywords: Reservoir, protection zones, web-based GIS

Eco-efficiency analyses of industrial system in Algeria

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Eco-efficiency is an instrument for sustainable analysis, indicating how efficient the economic activity is with regard to nature's goods and services. this paper presents a simplified LCA to asses the overall environmental effectsof fabric in Algerian treatment unit of surface production.

Keywords: Eco-efficency,simpliefied LCA, the treatment unit of surface, Algerian industry

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Impact of climate change in the Mediterranean region

Multisite modeling and prediction of annual and monthly precipitation records in the chelif watershed –Algeria-

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Precipitation is a hydrologic variable which is product of complex time-varying phenomena that are stochastic in nature. Rather than the seasonal effect, which is due to the annual revolution of the earth around the sun, precipitation can be affected by many other factors such as topography, distance from the moisture sources, temperature, pressure, air mass movements, etc. Climate change is an additional difficulty which affects the magnitude and the variability of precipitation, and the result is that rainfall amounts and their distribution vary temporally and spatially even in small areas.

Any effective water resources system planning, design and operation is tightly linked to the available water amount, which depends on a detailed study of precipitation, runoff and groundwater levels time series. Describing and predicting the precipitation variability in space and time are fundamental requirements for a wide variety of human activities and water project designs.

The objective of this paper is to develop a Kalman Filter (KF) model approach to multisite precipitation modeling and prediction, in addition to the assessment of associated errors. In order to apply the multisite KF, 51 year annual and monthly precipitation records (1959-2009) are used from 39 rainfall stations in the Chéliff watershed of the western Algeria.

KF is one of the most powerful tools in the optimal filtering theory. It is based on the least squares concept and operates with two fundamental estimates: the first one is based on a prior knowledge of the system, the second one is a prediction based on new information (measure). By combining these two independent estimates, KF leads to an improved estimate and its great advantage is to provide accurately the prediction error covariance, which is a measure of the estimation accuracy.

The obtained result is an on-line operation; where the estimator can deal with changes in the model, the parameters, and the variances. Hence, the precipitation predictor is not fixed with time and space, but adapts itself to the evolving meteorological conditions. Optimal predictions of annual and monthly precipitation amounts are obtained and the associated error covariance is given accurately. In addition, equal precipitation contour maps of the Cheliff watershed are provided together with the spatial variations of the associated errors, also in the form of maps.

Keywords: Kalman Filter, Multisite prediction, Precipitation, Cheliff watershed, Algeria.

Water footprint as decision support tool for sustainable water management in the Mediterranean Region

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In the Mediterranean basin countries, fresh water is becoming scarcer and more unequally distributed. In 2000, 130 million people in the Mediterranean region were living in water stressed countries (less than 1000 m3/inhabitant/year) and 45 million people were living in water scarce countries (less than 500 m3/inhabitant/year). 30 million people in the region do not have access to clean water, notably in the southern countries and the eastern region, and 27 million people do not have access to basic sanitation. According to estimates, the number of people living in areas with water shortages will increase to 63 million by 2025. Climate change, the growing demand for water in agricultural and urban development, as well as the expanding tourism industry, have further aggravated the water stress on the region. Agriculture is the main water-consuming sector and accounts for 64% of total water demand: 45 % in the North and 82% in the South and East. In numerous Mediterranean countries, water use is approaching the limit level of available resources.

There is considerable room for progress since improved water demand management would make it possible to save 25% of water demand, i.e. approximately 85 km3/year in 2025. Irrigated agriculture represents the largest potential for volume savings, with nearly 65% of total water potential savings identified in the Mediterranean (transport losses reduced by 50%, down to 10 %, irrigation water efficiency increased from 60 % to 80 %). A further 22 % in water savings potential can be expected from industry (recycling rate up to 50 %), and another 13 % from drinking water supply (transport losses and household leaks reduced by 50 %, respectively down to 15 % and 10 %). According to this optimistic view, assumed to be generalized throughout the Mediterranean countries, total water demand would level off at 102 km 3/year in the North and at 144 km3/year in the South and Middle East, globally equivalent to the drop in total current demand of approximately 40 km3/year. The benefits could also be seen in energy savings.

Water footprint based on the theory of virtual water can act as the tool for sinking the water demand in the agriculture. Virtual water is defined as the total amount of water that is used or polluted during the manufacturing process of a product, or that evaporates along the way. Virtual water consists of three components: green, blue and grey virtual water. From an ecological point of view it is usually preferable if products contain more green water than blue one. Blue water is taken from surface or groundwater and therefore is no longer available in the natural water cycle.

The water footprint is a further development of the virtual water. It informs how much water is consumed by the use of a product or service. By the estimation of the water footprint not only the level of the water consumption can be calculated, but also in which country this water was invested to produce these goods.

In this study the water footprint of main agricultural products in the countries of the Med Sea region is calculated. Based on these data proposals for sustainable water management is developed.

Impact of environmental hyperthermia and pollution by cadmium on biological markers of wistar rat

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The fast economic development has polluted the environment and led to a remarkable global warming worldwide characterized by a high temperature and humidity. In view of these changes, the investigation of different biological functions related to animal health is needed. Thus, experiments on the effect of heat stress-humidity (HSH), cadmium (Cd) and heat stress-humidity-cadmium (HSH-Cd) were performed in Wistar rats. Animals were exposed to cadmium for 8 consecutive days (200 mg $CdCl_2$ /1L drinking water), but they were exposed each day to HSH from 09: 00h to 13: 00h (mean temperature and relative humidity of 35 ± 1.187 °C and $76 \pm 4.825\%$ respectively). The control group was housed separately (mean temperature and relative humidity of 24.6 ± 2.125 °C and $53.4 \pm 6.125\%$). Though, some serum biochemical markers were evaluated. The obtained results showed a significant reduction in the growth (body weight) of the exposed groups compared to the control. It was observed a remarkable increase of electrolytes (Na and Cl), with the exception of potassium. The activity of ALT and AST was significantly higher in the HSH group only, but the levels of total proteins were increased in rats of HSH-Cd and Cd groups. The concentration of urea was increased in animals HSH and HSH-Cd, though that of creatinine was unaffected. Moreover, glucose concentration was reduced by HSH and enhanced by the HSH-Cd. The levels of triglycerides, cholesterol and total bilirubin were within normal ranges in all groups. Contrary, calcium level has recorded a significant decrease in both HSH and HSH-Cd groups. To conclude, the combined stress (HSH-Cd) caused more biological disruptions in rats than that of HSH or Cd alone.

Keywords: Biological markers, cadmium, electrolytes, global warming, heat stress, hyperthermia, rat.

In cloud alterations of desert dust and its impact on Mediterranean Sea

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It has been shown that (Saydam& Senyuva,2002) the temporal and spatial variability of bioavailable iron delivered to the ocean controlled via in-cloud photochemical reduction of desert dust, assisted by the impact of oxalate released by prokaryotes in the desert soil. The basic process in the photochemical production of bioavailable iron through decarboxylation reaction involves simultaneous action of oxalate released by the prokaryotes encapsulated in a cloud droplet, above some threshold solar radiation. The basic reaction mechanism from which this iconoclastic approach emerged based on the clay mineralogical properties as shown by (Sulzberger & Laubscher,1995). The authors have used oxalate as a reducing agent as to trigger the decarboxylation reaction since oxalic acid is assumed to be, a compound produced during fossil fuel combustion, or derived from urban and industrial activities. However, (Saydam and Senyuva,2002) has shown that oxalate is in fact produced by the prokaryotes present within the desert top soil that may be in the range of 107-1036 in number per gram of top soil. As shown by Sulzberger and Laubschereer(1995) the basic reaction mechanisms starts with the specific adsorption of reductant (oxalate) at the surface of Fe(III)(Hydr)oxide, in our case a desert dust particle and it is expressed as;

$\equiv$ FeOH + HC2O4 Fe C2O-4 + H2O; reaction (1)
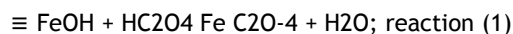
The absorption of solar light energy by this surface complex leads to a ligand-to-metal charge transfer transition within the surface complex, which can be reactivated or can also undergo primary photoproduct formation through dissociation and decarboxylation,

Fe C2O-4 k(λ) $\equiv$ Fe$_{II}$ C2O-4 $\equiv$ Fe (II) + CO2 + CO2• reaction(2)

Sulzberger and Laubcher (1995) further shown that the radical CO2• can act as a feedback mechanism and react with another surface or O2 or dissolved yet another Fe(III) species. (Mace et al.,2003) have further shown that rain and bulk aerosol samples were collected at a coastal site on the Eastern Mediterranean Sea at Erdemli, Turkey, contains various nitrogen (N) species, including nitrate,nitrite, ammonium, urea, and most important of all dissolved free amino acids and northern Africa indicated as a source region of the winds. Each synoptic scale meteorological event has its own unique precipitation pattern and each wet precipitation event enhances the surface waters with the end products of above reaction mechanisms hat results ith enhancement of bloom/high concentration of algae at various scales.. This hypothesis is being tested with available data through the Giovanni site. It has been shown that there exists a positive correlation among wet precipitation events and algae growth over Mediterranean Sea.

Keywords: Desert dust, cloud, rain, reduced iron, algae

Health impact assessment of the traffic related Greenhouse Gases (GHG) emission policies- the case study of Thessaloniki, Greece

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The objective of this work is to investigate the effect of GHG mitigation policies on public health. Specifically for the city of Thessaloniki traffic related policies are implemented, including the introduction of an underground railway and changes in the transportation mode (use of electric and hybrid vehicles). Traffic-originated pollution is assessed for the year 2010 and two future scenarios in year 2020, a business-as-usual (BAU) and a Greenhouse Gas (GHG) emission reduction scenario (CO2 scenario).

Traffic modelling and pollutant dispersion for the year 2010 is based on the use of well recognized models including, SIBYL (a model to project vehicle stock numbers, taking into account the internal energy consumption, emission and cost estimation capabilities per vehicle type), VISUM (a model to simulate traffic flow as a result of changes in travel demand), COPERT IV (a model compute emission per vehicle engine and type per chemical substance), OSPM (a pollutant dispersion model used on a large number of traffic corridors and motorways) and CALPUFF (a Gaussian dispersion model used on urban/peri-urban roads). For all roads/motorways where the daily throughput is greater than 10000 veh/day, yearly average concentration for PM10, PM2.5, NO2, and benzene is computed at a 100x100m grid. These estimates are compared with observations in 6 different measuring stations deployed across the Great Thessaloniki Area (GTA), in accord to the COST 732 guidelines.

The number of vehicles in Thessaloniki for the year 2020 is extrapolated based on estimates of Gross Domestic Product (GDP) projection and an appropriate use of the SIBYL model. Furthermore, using data from the VISUM model, the GHG emission reduction scenarios in Thessaloniki are investigated. For the underground rail system of Thessaloniki a decrease in traffic flow is modelled; a 33% decrease in traffic flow in major roads in proximity to the metro line, a 44% decrease in the Historic Center of Thessaloniki and a 22% decrease in all adjacent roads to the Historic centre. In addition, changes in traffic composition are investigated, based on guidance from the Ministry of the Environment and Climate Change and an appropriate use of the SIBYL model; diesel, hybrids and electric cars will constitute 22%, 7.7% and 2% of the total vehicle fleet respectively. Health impact from traffic pollution in year 2010 and the future scenarios in year 2020 is assessed using well established concentration response functions applied on high resolution population data differentiated by age and gender. Thus, attributed mortality from PM10 and NO2 and benzene induced leukaemia is computed at 100x100m grid across the GTA.

Results show an improvement in air quality in the city center and to a lesser extent in the GTA in 2020. A decrease in the number of spatially distributed incidences is computed, ranging from 10% up to 50% when compared to the business as usual scenario. The highest reductions are observed in the case of benzene followed by NO2 and PM10 in areas where the underground rail would affect transport demand and mode.

Keywords: Greenhouse Gas Policies, OSPM, CALPUFF, Health Impact, Metro

Chlorophyll-a variations in terms of meteorological forcing: The Rhodes Gyre and Cyclades region

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In the eastern Mediterranean Sea, characterised in general as an oligotrophic area, there are regions like the Rhodes Gyre revealing strong early spring blooms and others like the Cyclades Islands where no bloom is observed but a gradually increase from autumn to spring with the maximum values usually reached in March. These two regions are examined for the last decade –focusing on March-using satellite data, ECMWF Re-analysis ERA Interim data and climatological data from Hellenic National Meteorological Service (HNMS). There were cases where the chl-a values over Rhodes Gyre were more than doubled and small but significant differences were found locally over Cyclades region. Precipitation, wind speed and temperature were investigated as factors affecting these increases and found to have important and complementary influence, with the existence of a surface barometric low over Rhodes region being also important for the Rhodes Gyre. As these factors are characterised by specific trends over the last decades, a relation with climate change is also discussed.

Keywords: Satellite data, precipitation, wind, temperature, mean sea level pressure, GIS

Environmental Conditions that effect Greenhouse Gas Emissions fin Shallow Eutrophic Lake

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Greenhouse gases are emitted not only from industrial sources but also from natural ecosystems. Increasing nutrient concentrations as a result of anthropogenic activities increases the rate of eutrophication especially in shallow lakes. As a result, these ecosystems become major emission sources of CH_4, N_2O and CO_2 gases. In this study, our aim was to investigate the effects of environmental conditions (temparature, ligth intensity and pH) on GHG's emission rate in microcosms which are constructed with the sediment and water samples were taken from the Lake Eymir in Ankara and to develop related equations for GHG emissions.

Two separate microcosm sets were prepared. In the first set water, sediment, water+sediment samples were added into the 110 milliliters of glass bottles and incubated under the conditions of fluorescent light, dark, 4, 10 and 25°C. CO_2 and CH_4 gases were measured periodically with GC-TCD-FID systems. Second microcosm set was organized under the same condition with the first set but CH_4 and N_2O gases were measured by GC- μECD-FID system. NH_3, NO_2, NO_3, total phosphorus, COD concentrations and VOC, conductivity, pH values of sediment and water samples were measured before the construction of microcosms. The highest greenhouse gas concentrations for both sets were obtained from the bottles under the dark conditions. Maximum CO_2 and CH_4 concentrations were measured 7.63%, 19.34% and after 27 - 55 days respectively from the sediment bottles at 25°C. According to results of the second set, the maximum CH_4 and N_2O concentrations were measured 503.51, 54.44 ng/ul at 25 - 10°C and after the 134 – 8 days respectively from the sediment+water bottles. Gas concentrations were calculated and tabulated, as a function of time. Sediment works as a gas producing center for both sets of microcosm and dominant bacteria populations of these regions was determined by 16S rRNA sequence analysis.

Keywords: microcosm, eutrophic lake, greenhouse gas

Evaluation of Land Surface Temperature Effect in Megacity Istanbul Using Thermal Remote Sensing

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Land surface temperature (LST) plays an important role in local, regional and global climate studies as an indicator of the energy balance at the Earth's surface. Accurate and reliable knowledge of the surface temperature is necessary to provide information about the surface characteristics and climate. Urbanization is the main component that affects the LST. Remotely sensed data is very effective and reliable tool to characterize land use and land cover categories. Therefore, the technology has the ability to derive continuous land surface temperature information for different scales. In this study, megacity Istanbul, with the population of over 13 million, is selected as the study area. İstanbul is experiencing an accelerated urban expansion over the past 60 years. The city is in a period of urban regeneration because of an expected earthquake potential and global dynamics. Due to the resulting massive building campaigns and rapid destruction of green areas, significant impacts have been occurred on the ecosystem and the climate. Very sensitive and valuable vegetated areas are transforming to artificial surfaces. 2011 dated Landsat 5 TM data was used to determine the relationship between LST and land cover categories. LST were derived by using thermal band of Landsat image with the help of mono-window algorithm. Meteorological recordings belonging to the same date and hour of the satellite sensor image that were provided from the meteorological stations of Istanbul are used as meteorological data in the study. Pre-processing steps were applied to Landsat TM data such as radiometric correction. Digital numbers (DN) of the image was transformed to radiance and reflectance values. Normalised Difference Vegetation Index (NDVI) was calculated and used to determine the relationship between LST and vegetation. Regression methods include linear, exponential, and polynomial were used to analyse the potential of the selected methods. The results show that vegetated surfaces have negative relationship with LST. This suggested that the areas with high rate of vegetation will decrease LST and urban heat island rise in Istanbul.

Keywords: Land Surface Temperature, NDVI, Landsat 5 TM, Istanbul

Effect of Climatic Change on Güzelyalı Landslides, NW Çanakkale, Turkey

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A landslide is a phenomenon which consists of a range of ground movement, such as rockfalls or slope flow, which can occur in onshore, offshore and coastal environments. The most important parameters for the occurrence of landslides could be specified as height, slope, aspect, distance to stream, vegetation index, litology, distance to fault, curvature, distance to coast etc. However, sudden climate changes unexpectedly accelerate the movement of the landslide mass. Not included in the data analysis of climate models produce results that are not statistically significant enough. In Canakkale, Turkey, in 2009-2010, it was increased by 75% in the amount of rainfall with respect to the previous years. But, the rainfall anomaly was the rate of 50% in 2011. Compared to 2011, there was 50% increase in the amount of rainfall over of the year 2012 in Canakkale. As it is known in Turkey in December of 2012, it has been more rainfall than normal in general. Although the average monthly rainfall continued for many years was 88.8 mm, it was 152.2 mm in December 2012. It is clear that it was 71.4% increase compared to normal rainfall in recent years. Moreover, this was an increase of over 100% in Canakkale. There exist potential landslide areas in the village of Guzelyali and its around, NW Canakkale. In this region, some landslides affecting to the settlements and the transport network have occurred in 2003, 2005 and 2009. Due to the mentioned heavy rains, in the first quarter of 2013, landslides significant movements have occurred in Guzelyali. In this study, the logistic regression model is applied model the relation between dependent variable and independent variables. Using technique of logistic regression, occurance of landslide potantial is determined from independent variables. Values of independent variables are produced from topographic maps, satellite images, geological map, rainfall data. Landslide susceptibility of Guzelyalı is periodically analyzed considering amount of montly average rainfall. The results show that increase of rainfall amount is triggered the movement of the landslide mass in study area. Obtained landslide susceptibility maps will help for decision making for planners and local government.

Keywords: Climate Change, Landslide, Logistic Regression, Susceptibility, Spatial Data

Support for EU fundraising in the field of Environment & Energy - BayFOR, Munich (Germany)

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The Bavarian Research Alliance (BayFOR, http://www.bayfor.org) is a private company for the support of Bavaria (South-East of Germany) as a centre for science and innovation within the European Research Area. It was set up on the initiative of the Bavarian universities to strengthen their networking at regional, national and international level while helping them to prepare to meet the requirements for European research funding. The focus is directed at the current EU Framework Programme (FP7) and the forthcoming Framework Programme for Research and Innovation "Horizon 2020", but also comprises the wide range of European programmes (e.g. FP7, LIFE+, Interreg, COST, EUREKA, ERA-Nets, IEE (CIP), LLP, Calls for tender).

BayFORs overall aim is to strengthen and permanently anchor the science and innovation location of Bavaria in the European Research Area through:
- Initiation of national and in particular European innovation and science partnerships from academia and business
- Improvement of innovation potential of Bavarian universities and SME
- Support in acquisition, management and dissemination of results of European and international projects in the field of research and technological development

The service portfolio of the EU Funding Advisory Service reaches from the first project idea to project implementation:
- Recommendation of funding programmes/instruments (incl. integration of relevant EU policies & directives)
- Partner search
- Project development and proposal elaboration (Online platform, Creation of consortium, Attendance at meetings, Preparation of documents, Proposal structure elaboration, Provision of templates, Editorial support: Gantt, PERT, Impact, EU added value)
- Support in the Contract negotiations with the European Commission
- Project implementation (Project management, dissemination, Science-Policy-Interface)

The minimum condition for BayFOR support is at least one partner from Bavaria (Germany) must be part of the applying consortium.
BayFOR staff has profound knowledge and experience in disseminating research project outcomes, in particular with regard to the adaptation of results to the needs of relevant target groups like science, industry/SMEs, policy makers and the public. Furthermore, BayFOR can draw on distinct experience in the management of European research projects (mostly FP7 but also CIP and INTERREG).

As a partner in the network for SMEs "Enterprise Europe Network" (EEN), BayFOR offers advice and support on topics such as funding, research programs, public procurement, market penetration and the promotion of innovation at European level. Beyond, BayFOR will make use of its regional networks to promote uptake and exploitation of project results.

BayFOR is also commissioned by Bavaria's State Ministry of Science, Research and the Arts to look after the Bavarian University Funding Programme for the Initiation of International Projects (BayIntAn). Our efforts are aimed at initiating or strengthening transnational collaborative research involving Bavarian universities and universities of applied sciences. Bavarian state universities and universities of applied sciences are entitled to apply. The objective of applied projects is to further transnational scientific cooperation; therefore every project must have at least one international partner. The funding is usually allocated to travel and accommodation expenses.

BayFOR is a partner institution in the Bavarian "Haus der Forschung" (www.hausderforschung.bayern.de/en).

Keywords: EU-fundraising, environment programs, proposal preparation, Horizon2020, European ResearchArea, Bavarian Research Alliance

Investigation of drought conditions in Mediterranean Region of Turkey using remotely sensed data

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Drought is one of the major natural hazards when water scarcity occurred for a period of time (months or years) as a result of insufficient precipitation, high evapotranspiration, and high usage of water resources. It has significant adverse effect on the socioeconomy, agriculture, and ecosystem. Since Mediterranean Region of Turkey lies drier climatic zone than northern part of Turkey (Black Sea and Marmara Region), this region has been affected by droughts more frequently.

In this study, the Moderate Resolution Imaging Spectroradiometer (MODIS) data were used to analyze vegetation and land surface temperature changes and drought dynamics between January 2006 and December 2010. 2007 was a drought year and data obtained before and after these years were used to determine the impacts of drought over the research area. MODIS derived Normalized Difference Vegetation Index (NDVI), Enhanced Vegetation Index (EVI), Land Surface Temperature (LST) and Temperature-Vegetation Index (TVX) were used to analyze vegetation and drought conditions in Turkey for the given period. Information related to vegetation conditions were derived from 16-day composite 250 m spatial resolution NDVI-EVI data and temperature conditions derived from 8-day composite 1 km spatial resolution LST data compiled by U.S. Geological Service MODIS Reprojection Tool Web Interface (MRTWeb). Temperature-Vegetation Index (TVX), combination of NDVI and LST was also used in the study considering that TVX gives more spectral information for drought detection. The relationship between NDVI and LST could provide information for drought detection. TVX is negatively related to water condition. Land Surface Temperature (LST) values derived from thermal bands are important since temperature is sensitive to the drought phenomenon and it is negatively correlated with NDVI values. By using this correlation, drought areas and periods for the research area were investigated.

Keywords: Remote sensing, MODIS, drought, climate

Long-Term Precipitation and Temperature Analysis in Buyuk Menderes Watershed, Turkey

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Buyuk Menderes Watershed is one of the 25 watersheds of Turkey located at the south western part of the country with a coastline along the Aegean Sea. The watershed covers an overall surface area of 2 600 967 ha where the main stream, Buyuk Menderes, flows through it with a length of 584 km. The watershed owns the highly industrialized regions of the country. In parallel to industrialization efforts, agriculture is an equally significant sector as the governing land is fertile and suitable for agricultural activities. Almost 45% of the watershed's land is spared for agriculture. Stream water is partly withdrawn for drinking water supply and partly for irrigation. However, due to lack of insufficient number of wastewater treatment plants, the water quality in some parts of the stream has become highly deteriorated. Besides, there are lots of special protection areas and wildlife protection and breeding areas within the watershed. 79% of the water supply is consumed in irrigation while the rest 21% is used by industries and domestically.

In this study, daily temperature, net rainfall (precipitation–evaporation) data for a period of 37 years (1975-2012) is analyzed thoroughly. There are 9 meteorological stations within the watershed and similar data are obtained from each of the stations. Initially, a homogeneity test is performed among the 9 stations to fix the location of the stations and check their status within the long-term. Then, monthly, seasonal and annual temperature and net rainfall analysis along with their standard deviations are realized. Parametric (least-square linear regression- LR) and non-parametric statistical tests (Mann-Kendall & Sen's slope- SS) with confidence limits of 90% and 95% are also applied. The analyses performed will form the main scope of this paper.

During the EU accession period, Turkey has to compile and harmonize with EU legislation including environmental aspects. Thus, a noticeable attention is paid to the watersheds regarding EU Water Framework Directive. Till the end of 2013, Turkey will complete the Action Plans of each of the watersheds and will start preparing the Watershed Management Plans in 2014. For a comprehensive management plan, surveys and analyses on different items of the watershed need to be satisfied to come up with the convenient management strategies. Among these surveys and analyses meteorological trend analyses are among the priorities in a watershed as it will further be used in runoff and flood analysis in the long run as well as in the watershed modeling studies. Furthermore, this study that considers a time period of 37 years will also put forth the effect of climate change in the watershed.

Keywords: Buyuk Menderes, precipitation and temperature analysis, Mann-Kendall analysis, Turkey, Sen's slope

Effects of climatic conditions on physic-chemical characteristics of a sandy soil irrigated with saline water in arid region in Tunisia

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The shortage of water resources of good water quality is becoming an issue in the arid and semi arid regions. For this reason, the use of water resources of marginal quality such as saline groundwater has become an important consideration, particularly in arid region in Tunisia, where large quantities of saline water are used for irrigation. Nevertheless, the use of these waters in irrigated lands requires the control of soil salinity. The aim of this study was to investigate the effects of saline water used for irrigation on some soil physic-chemical characteristics.

The study was carried out in the experimental site of the Olive Tree Institute of Sfax, Tunisia. Two olive orchards were subjected over two successive crop seasons to two drip irrigated treatments: control field irrigated with fresh water (CF, ECe = 1.2 dS m-1), and saline field irrigated with saline water (SF, Electrical Conductivity ECe = 7.5 dS m-1). The controlled parameters were soil moisture, Na+, K+, Cl-, Ca2+, Mg2+, N, CaCO3 and organic matter contents, pH, Sodium Adsorption Ratio (SAR), ECe, exchangeable Sodium Percentage (ESP) and soil texture. Soil samples were taken from the surface until a depth of 1.2 m with a layer of 0.3 m. For the ECe, it was determined also at different distance (0, 0.3 and 0.6 m) from the irrigation source. The long term saline water irrigation has induced the accumulation of salt ions (Na+, K+, Cl-, Ca2+ and Mg2+) in SF at higher levels than that at CF. The soil salinity distribution (ECe) showed that the highest levels of soil salinity, accompanied with the lowest levels of soil moisture, were recorded during summer season. The rainfall occurring during autumn and winter maintain the salts leaching and thus low salinity values, in comparison to summer season. The horizontal distribution of soil salinity showed that the more moist layers (root zone) have low level of soil salinity. Despite, the increase of salt ions contents in SF orchard, the drip irrigation system has allowed the upholding of a stable soil structure (sandy) and the soil permeability was not too damaged.

Keywords: Water salinity, sandy soil, arid region, electrical conductivity, salt ions, sodium adsorption ratio

CLIWASEC – A research cluster on Climate Change Impacts on Water and Security in Southern Europe and neighboring countries

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The Mediterranean region is experiencing a broad range of threats to water security. According to climate projections, the region is at risk due to its pronounced susceptibility to changes in the hydrological budget and extremes, which is expected to have strong impact on the management of water resources and on key strategic sectors of regional economies. Related developments have capacity to exacerbate tensions, and intra- and inter-state conflict among social, political, ecological and economic actors. Effective adaptation and prevention policy measures call for multi-disciplinary analysis and action.

The research cluster CLIWASEC
The European Commission actively prepares Europe and neighboring regions for climate induced ecological and socio-economic challenges that lie ahead and has placed related priority research topics in the Seventh Framework Program for Research and Technological Development (FP7). Three projects form the research cluster CLIWASEC (CLimate change Impacts on Water and SECurity, www.cliwasec.eu) for multi-disciplinary scientific synergy and improved policy outreach. CLIWASEC comprises a critical mass of scientists from 44 partners (29 institutions from the EU, 5 institutions from S&T countries and 10 international institutions) to build relationships with relevant policy representatives and stakeholders at EU level and Mediterranean and neighbouring countries covered by the projects. It tackles most relevant research questions with regard to climate change impacts on water resources as a threat to security in an integrated way: WASSERMED (FP7-ENV) – Water Availability and Security in Southern Europe and the Mediterranean, co-ordinated by Roberto Roson (CMCC, Italy) - www.wassermed.eu CLICO (FP7-SSH) – Climate Change, Hydro-Conflicts and Human Security, co-ordinated by Giorgos Kallis and Christos Zografos (UABICTA, Spain) - www.clico.org CLIMB (FP7-ENV) – Climate Induced Changes on the Hydrology of Mediterranean Basins, co-ordinated by Ralf Ludwig (LMU, Germany) - www.climb-fp7.eu.

Scientific Synergies and Policy outreach
The three projects are joining forces to foster scientific synergies and to establish a more focused and efficient policy outreach strategy. Major building blocks of this collaboration include scientific exchange and review, identify and utilize complementary monitoring and modeling methods, harmonize and share data and discuss dissemination strategies or elaborate and propose adaptation alternatives. The projects have agreed on joint annual general assemblies, a dissemination plan for presenting the results of the three projects in the scientific literature and the setting up a cluster project web-portal, which hosts and advertises further related projects. Policy briefs of the projects findings are prepared and posted on the cluster website on an event basis. At any time, regional, national and international stakeholders and policy bodies are invited to express their research needs and recommendations.

To optimize benefits from the variety of cluster partners' competences, joint research must be devoted towards a better understanding and description of interfaces in such complex systems. Two main challenges lie ahead: i) bridging scales and ii) quantifying and reducing uncertainty. Integrating different methods from natural and social sciences can contribute to better conceptualize each project's research findings and propose solutions for water resource management under climate change, especially when a variety of different situations can be covered in complementary case studies.

Keywords: Climate Change Impacts on Water and Security, Mediterranean Region, FP7 research cluster, Southern Europe, neighboring countries, CLIMB, WASSERmed, CLICO

Impact of climate change on atmospheric stability and its environmental effects in the Mediterranean region

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A wide set of regional climate model simulations has become available for analyzing future scenarios at regional scale. Some of them are results of coordinated international projects (PRUDENCE, ENSEMBLES, CIRCE, MedCORDEX) and are in part downloadable from project archives. Those model simulations represent realistically the atmospheric circulation and physics and their outputs contain information on the conditions of the atmospheric boundary layer. This study uses the model Richardson number, surface wind speed, global solar radiation and long wave net balance at the surface for estimating, on the basis of the Pasquill-Gifford stability classification, the stability conditions of the atmospheric surface layer. High stability conditions are obviously associated to inhibition of vertical mixing and prevent the dispersion of pollutants in the air. An increased of frequency of steady atmospheric conditions would favor high concentration of pollutants in small areas close to critical sources with negative effects on human health and the environment. A specific analysis is provided by model simulations carried out within the MedCORDEX project with the COSMO-CLM model. COSMO-CLM is a regional climate model which represent the climate oriented derivation of the meteorological Local Model of the German Weather Service as currently developed by the CLM (Climate Local Model) community. The atmospheric component of the model is non hydrostatic and is currently used at spatial resolutions between 1 and 50 km. In this study we use a 0.44 deg resolution covering the whole Mediterranean Area from 6W to 51E in longitude and from 25N to 52N in latitude. Two simulations are considered: a regional analysis based on ERA-INTERIM data and a climate analysis of the 1951-2050 period downscaling the CMCC-CM global model contribution to the CMIP5 project (the RCP 4.5 emission scenario is adopted). Time series of stable condition frequency (Pasquill-Gifford class F) are computed at the model grid points in order to verify whether there are statistically significant changes, which may be important for the environment in presence of intense pollution.

Keywords: Climate change, surface layer, atmospheric stability, air quality

Potential impacts of sea level rise on the coastal vulnerability of Çukurova delta

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Among the numerous effects of climate change, sea level rise can be addressed as one of the most severe coastal disasters regarding its physical impacts on the coastal regions housing high population and economic activity. In this study, the most vulnerable areas due to sea level rise in Turkey based on Coastal Vulnerability Index (CVI) analysis are defined and a comprehensive analysis conducted to assess the vulnerability of the Çukurova Delta, considered as one the most susceptible areas under the projected inundation by the end of the century is summarized. The level of inundation is estimated from multi-mission satellite altimetry sea level anomaly, significant wave height and also the effects of tidal and meteorological forcing. Consequently, the maximum level of flooding expected to occur by 2100 reaches up to 6.7 meters through the Çukurova Delta and GIS-based inundation mapping on the high resolution elevation model indicates that 69% of the area would be at risk of flooding. Considering the local sea level rise in Çukurova by the end of this century, immediate adaptive measures must be undertaken for the protection of this coastal zone. In addition, it will be of the utmost importance to make an inventory of the vulnerable zones comprising coastal aquifers and ecosystems and to introduce adaptive long-term strategies related to local coastal zone management plans.

Keywords: Climate change, sea level change, satellite altimetry, GIS, Çukurova Delta

Combination of hydrological modelling and GIS for predicting runoff hydrographs in small urban catchment

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Most of the catchments, especially in the developing world, lack the adequate discharge measurements necessary for model calibration. These facts lead hydrologists to the challenge of predictions in ungauged catchments. One possible approach to deal with the problem of predictions in ungauged catchments is to establish transfer functions which associate model parameters with relevant hydrological characteristics. Due to the relative scare data in these areas, lumped parameters are used to simplify the hydrological processes. The most recent studies, which aimed to simulate the rainfall-runoff response of small catchments in semi-arid regions, used semi-distributed models.

In this study the linear reservoir Model, parallel cascades model, the HEC-HMS and WBNM software and GIS were used to predict direct runoff hydrographs in of a small urbanized catchment located in Azzaba in the north-east Algeria. The prediction presented how the catchment responds to rainfall events of return period of 50-years obtained from the constructed IDF Curves, for current land use. The main result from this study is that it has demonstrated how modelling tools can be used to study the potential effects of actual urban development on storm runoff.

Keywords: Catchment, GIS, Runoff hydrograph, IDF Curves, HEC-HMS, WBNM

Impact of urbanization on the surface climate

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Urbanization alters the natural land surface by 1 - reducing the vegetation fraction. this induces a reduction in photosynthesis and transpiration. 2 - The increase in albedo and changes in energy balance, 3 - modification of soil permeability and change in surface hydrology, and 4 - the modification of the surface roughness and turbulent flows. These physical changes can lead to the creation of an urban microclimate, mainly characterized by the phenomenon of Urban Heat island (UHI).

The study presented in this paper is a part of a thesis project being developed. Its objective is to quantify the influence of the urban area on the surface climate.

For this we calculate the energy exchange between the atmosphere and the land surface of the city of Marrakech using Simple Biosphere model (SiB2). This will allow to study the spatial and temporal variability of temperature and thus to evaluate the magnitude of the urban heat island and its implications for the amount of energy required for heating (winter) / cooling (summer).

Keywords: Urbanization, Urban Heat island, urban microclimate, surface climate, Simple Biosphere model

Effect of Vegetation for the Availability of Water in Ankara under the Expected Impacts of Climate Change

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Water resources have crucial importance to meet future drinking water demand and to avoid present and future problems such as floods, droughts and pollution. Thus, exploring and evaluating the results of climate change, that have direct or indirect influence on water resources and flood events, is of common interest to researchers. Also, the relationship between precipitation and surface runoff should be investigated to assess importance of both parameters for availability of water. In order to investigate water demand of Ankara capital city of Turkey under projected influence of climate change. In this research, the contribution of precipitation to runoff is studied through correlation analysis between meteorological records of DMI and flowrate for Sakarya and Kızılırmak rivers in and around Ankara gauging logs provided by State Hydraulic Works (DSI). Meteorological records belong to 25 stations in and around Ankara. The data from gauging stations contain 25 years-long monthly total flows of tributaries of Sakarya and Kızılırmak rivers in and around Ankara. Considering the relationship between precipitation and runoff, correlation ($R2 <= 0.5$) is found to be weak. This might be attributed to the importance of evapotranspiration for availability of water. The observation is that both precipitation and runoff exhibit the same pattern after April, indicating the water use by vegetation. Considering the impacts of climate change on temperature and precipitation, likely effects of changes in vegetation period on availability of water for Ankara are discussed and precautionary measures are suggested.

Keywords: Climate Change, Ankara, Precipitation, Runoff, Vegetation

Assessing climate change impacts in Greece through localized impact assessment models

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The Mediterranean region is generally acknowledged to be a very sensitive region to climatic pressures (e.g. IPCC AR4 report, UNEP-MAP) being located at the intersection of the desert climate of Africa and the European continental climate. The complicated topography and strong sea-atmosphere interactions give rise to many small scale features and local patterns which require particular consideration and the application of downscaling modeling frameworks. According to (Giorgi 2006) it has been identified as one of the most prominent "Hot-Spots" in future climate change projections.

Furthermore, as the economic activity in the majority of the Mediterranean countries is heavily influenced by the climate conditions (e.g. agriculture, tourism) climate deviations from normality are expected to significantly influence the lives of millions of exposed people. As current estimates (JRC PESETA project, Bank of Greece study, 2011) put climate impact costs to the order of billions of Euros, the detailed analysis of the costs and benefits of adaptation will be an extremely useful decision support tool in deriving timely and accurate actions.

Within the above context, the present work establishes a consistent and extensive bottom-up framework for assessing sector-specific vulnerability to climate change: water resources, agricultural production, energy supply and demand, public health, and tourism. Additionally, an analysis of the impacts on urban environments and difference in frequency and magnitude of related natural hazards will be performed. The proposed analysis attempts to harmonize input requirements for conducting the impact assessment, where all analysed models may use the same climate data. The results will be presented in terms of the pathway within our work as follows:
1. Obtain a high resolution downscaled RCM.
2. Define a set of suitable surrogate data, required to estimate exposure to climate pressures.
3. Assess and develop a series of high resolution consistent impact assessment functions and consistent data inputs.
4. Assign an economic value to the determined impacts, where appropriate, per type of economic sector.
5. Determine higher order effects and cascading impacts from selected categories of impacts.
6. Define suitable adaptation strategies and prioritise the most effective ones.
7. Assess and analyze associated uncertainties in the modeling process.

Keywords: Impact assessment, climate change, Greece

Regime shifts in the Adriatic Sea ecosystem

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In the changing climate, the majority of global change impacts on the Adriatic marine ecosystem become important. To clarify this link we investigated Northern Hemisphere climate influences on the long-term variability of the Adriatic Sea ecosystem during the period 1961-2010. Due to the more frequent and stronger changes in the atmosphere, established paradigm between ingressional/non-ingressional regimes in the Adriatic Sea, introduced by Buljan (1953), which implies an increase/decrease in salinity (and density) due to the strengthening/weakening of LIW intrusions to the Adriatic Sea should be revised as suggested by Civitarese (2010). Establishing anti-cyclonic and cyclonic circulation in the Ionian Sea (Bimodal Oscillating System), salinity in the southern Adriatic is oscillating between the periods of reduced and enhanced salinity. In the middle Adriatic the thermohaline regimes are also oscillatory and more or less synchronous with Ionian salinity fluctuations, depending on the stronger/weaker intrusions from the Mediterranean, i.e. depending on the established cyclonic/anticyclonic circulation in the Ionian Sea (compare Fig. 2 in Civitarese et al. 2010 and Fig. 9 from Matic, et. 2011).

The use of a sequential algorithm for regime shift detection applied to the abiotic and biotic datasets (from plankton to sardine/anchovy ratio) revealed significantly different periods in mean levels before and after the crucial year 1987. Opposite patterns observed throughout the ecosystem appeared to be linked to modifications in thermohaline circulation related to the Eastern Mediterranean Transient, whose effects prevented warm and salty water mass intrusions into the Adriatic Sea. Weak ventilation of the Adriatic was also evident in the lower than normal sea temperature and oxygen concentrations below the thermocline. These results provide evidence on connections between the shifts in the middle-Adriatic ecosystem and the Northern Hemisphere climate system via changes in regional atmospheric conditions, and highlight the importance of global climate changes for the Adriatic Sea ecosystem state.

Keywords: Mid-latitude teleconnections, Adriatic climate, regime shift, plankton, pelagic fish

Model Supported Hydrological Analysis of Darlik Watershed, Istanbul, Turkey

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İstanbul which is the most crowded city of Turkey, is also among the world's highly populated cities, and its population is increasing day by day so that water resources of this metropolitan are under excessive stress. Today, population of this huge metropolitan is about 13.500.000 and this mega city needs approximately 2.250.000 m3 water per day. Considerable amount of this demand -almost all- is supplied from the dams around the city and by interbasin water transfer. Darlık Reservoir, located north-east of Istanbul, supplies the 12% of İstanbul's demand, has 209 km2 catchment area is one of the important reservoirs of this metropolitan and has not affected by urbanization and industrialization yet.

This study aims reveal the water budget components depending on watershed characteristic using a hydrological model. WEAP (Water Evaluating and Assessment Program) is used as the hydrological model in this study. Watershed is divided to 18 subwatershed and daily data were used such as precipitation, temperature, humidity, wind and cloudiness were used as meteorological parameters.

Model was run between 1986 and 2011 hydrological years and components of water budget were calculated. Surface flow constituted 83% of stream flow. Percentage of subsurface flow and groundwater flows were 2% and 15%, respectively. In summer months ratio of surface flows to stream flows decrease to 25%, while subsurface flow and groundwater flow increase to 23% and 52%. These results show that sustainability of Darlık Watershed ecosystem in summer months depends on groundwater flows. According to the DSI (General Directorate of State Hydraulic Works) study the surface flow of Darlık Watershed was 96 billion m3 between 1972 and 1990. Model, which was used in this study calculated surface flow as 98.8 billion m3 for same period. It shows that model runs with 3% error margin relative to DSI study.

According to the results of model it was revealed that 33% and 4% of precipitation constitutes the surface runoff and subsurface flow, respectively. 11% of total precipitation turns back to the atmosphere by evapotranspiration. 27% of precipitation infiltrates and 12% percolates to the groundwater storage.

This study reveals the water budget of the Darlık Watershed. Increased population and industrialization efforts will have adverse effect on water resources of this watershed in the future. Due to lack of information about hydrological components could cause inconvenient management strategies on watershed. On the other hand climate change impacts in relation to water resources are negligible and can be foreseeable with proper models and data. These results and analyses will further be used in climate change impacts on water resources and watershed management plans. Therefore, this study attempt to provide data to scientist and decions makers to start preparing comprehensive watershed management plans for megacity İstanbul.

Keywords: Darlık Watershed, hydrological analysis, hydrological Modelling, Water budget, WEAP

Conservation agriculture as a mean of CC adaptation in the semiarid zones of Morocco: Long-term effects on soil quality and water conservation

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In Morocco, water scarcity is a major factor limiting agricultural production. Water shortage is accentuated by soil quality depletion exaggerated by intensive cropping and tillage systems that cause a decline in soil fertility, structure and organic mater. Facing all these problems, conservation agriculture (including no-tillage) has been proposed as a potential system for improving soil quality and providing stable yields through minimum soil disturbance, surface crop residue retention and crop rotations. This research was conducted in the semiarid Chaouia plain in order to provide more scientific evidence about the effects of conservation agriculture on selected properties of a vertisol including soil moisture, organic matter, pH, total N and aggregate stability. Two tillage treatments were compared: no-tillage system (NT) and conventional system (CV). After only six years, there is a restoring in soil balance in plots with no-tillage which results in an increase in soil moisture, total nitrogen stratification and a pH decline. These observations are confirmed by the increase of organic matter in sampled horizons (0-50, 50-100 and 100-300 mm) originated by direct drilling. Consequently, there is a better performance of soil aggregates of the direct drilling plot with regard to the different stresses caused by the mechanical tests which are evidenced through Le Bissonnais method (1996) and that of Youker & McGuiness (1956). This usually leads toward soil consolidation and increasing the soil resistance to wind and water erosion. Finaly, these results indicate that the increased yield associated with no-tillage system can be explained by both better water conservation and soil quality improvement.

Keywords: no-Tillage, soil quality, soil moisture, soil organic matter, aggregate stability

Renewable energy sources

The Role of Hydrogen in the Promotion of Large-Scale RES Integration in Aegean Sea Island Grids

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To confront problems encountered at the level of electricity generation networks concerning large-scale integration of renewable energy sources (RES), the idea of introducing energy storage constantly gains ground. Benefits stemming from the adoption of energy storage may be synopsized in the exploitation of otherwise wasted amounts of energy (e.g. rejected amounts of energy can be recovered), the increased reliability of energy supply (since energy stores may become available whenever required) and the improved operation of the power system (e.g. operation of conventional units at optimum point).

In this regard, contribution of such systems in achieving large scale integration of RES into island grids is currently considered. Among them, large-scale battery energy storage is presently examined, in comparison to the technology of fuel-cells and hydrogen storage (FC-HS) that has during the recent years received considerable attention.

For this purpose, an integrated simulation algorithm is developed, investigating in detail the performance of different energy storage technologies used to support large-scale RES integration, with emphasis given on FC-HS. In this context, hybrid wind-photovoltaic configurations are currently examined, aiming to exploit both the high-quality solar potential met across the entire Aegean Sea area and the medium-high quality wind potential encountered in many areas of the Aegean Sea islands.

In addition, and in order to capture the impact of the local RES potential quality, the developed algorithm is then applied to three representative island areas of the Aegean Sea, with different RES potential characteristics. Results obtained indicate that the solution of FC-HS may become cost-effective in comparison to certain battery types, especially if multiple use of hydrogen to cover other energy flows (e.g. transportation needs) is also taken into account, thus contributing substantially in the replacement of conventional fuel energy sources and the reduction of greenhouse gas emissions.

Keywords: Fuel Cells, Hydrogen Storage, Wind Potential, Solar Potential, Lead-Acid Batteries

Effect of Sludge Management Strategies on Minimizing Global Warming Potential at a Municipal Wastewater Treatment Plant of a Megacity

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Emission of greenhouse gases (GHGs) from municipal wastewater treatment plants (WWTP) receives an increased concern due to their potentially significant contribution to climate change. In this context, N2O, CH4, and CO2 carry special consideration because of their global warming potential (GWP). Meanwhile, use of food disposers is proposed as an alternative way of minimizing waste at source because the separation of a considerable fraction of food-waste ingredients out of the entire municipal solid waste (MSW) stream is enabled by grinding the waste with the addition of tap water, and allowing for the mixture into the sewage system. Through this method, weight of the remaining garbage to be removed as MSW is reduced. In this paper, improvement in biogas production and its total (electricity+heat) energy equivalence will be evaluated in the case of kitchen waste integration, and the results will be compared with the current situation (without kitchen waste integration) at a municipal WWTP located in one of the metropolitan cities in Turkey. Moreover, the effect of different sludge disposal alternatives (e.g. incineration, composting, etc.) will be discussed from the aspects including energy consumption/production and the GHGs emission, while comparing the results with the current sludge disposal via uncontrolled landfilling. Annual average influent characteristics of the wastewater (Q≈155,000 m3/day), and annual electricity consumption of the WWTP have been taken from the investigated WWTP, and the change in the characterization due to food waste introduction was evaluated. The WWTP currently contains activated sludge system with a biological nutrient removal process and the mesophilic anaerobic digester is digesting (SRT=24 days; Veff=6,750 m3) only the gravity-thickened primary sludge (TS%≈8). When kitchen waste is integrated, the WWTP would be upgraded in terms of; (i) thermophilic digestion (SRT≈13 days) with the existing digester volume, and (ii) MAP precipitation of the filtrate arising from dewatering after anaerobic digestion. In thermophilic digestion, produced biogas amount is increased normally about 30% compared to mesophilic digestion. In the current situation, about 22% of the annual electricity consumption of the WWTP could be provided from the produced biogas, whereas more than half of the annual electricity consumption of the WWTP could be provided in the case of kitchen waste integration. At the same time, all heat requirements could be supplied with the produced biogas for each case. Moreover, substantial excess heat (i.e. 4 times more in the case of kitchen waste integration) is obtained which can be utilized elsewhere in the premises of the WWTP. When the WWTP is evaluated according to its GWP, results indicated that ca. 153.5 and 149.2 kg CO2-eq/person/year emission factors are calculated without and with kitchen waste integration, respectively, in case of considering current sludge disposal method. Moreover, minimum GWP is found when sludge is disposed of via composting (-67.67 kg CO2-eq/person/year) instead of uncontrolled landfilling (149.2 kg CO2-eq/person/year), in case of kitchen waste integration. Hence, the WWTPs should be operated and/or upgraded regarding not only energy saving but also decrease in GHGs emission that is worldwide concern from the point of global warming.

Keywords: Carbon footprint (CF), kitchen waste integration, energy recovery, biomethane production

Investigation of co-combustion of Mediterranean biomass fuels with lignites

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Co-combustion of biomass fuels with coal in existing power plants is very important, because apart from the environmental benefits it offers technical and economic benefits, by replacing part of conventional energy sources, while at the same time using existing infrastructures. The knowledge of the behaviour of coal and biomass mixtures during combustion is essential for the effective operation of the conversion units, as interactions may occur between them, which may affect the overall efficiency of the process. This work aimed at investigating the ignition and combustion characteristics of various biomass materials from the Mediterranean region, three lignites from different seams in Northern and Southern Greece and their blends and at evaluating the compatibility of each component in the blend. The experiments were conducted in a thermogravimetric analysis system at non-isothermal heating conditions, over the temperature range 25-850°C. The performance of the process was evaluated in terms of combustion rate, burnout temperature and time, as well as ignition and combustion indices.

The results showed that the combustion process was controlled by the emission of volatile matter. Biomass materials with volatile contents up to 78% indicated ignition temperatures between 238°C and 261°C, while the lignites with volatile contents up to 57% ignited between 246°C and 297°C. The ignition temperature of the lignite/biomass blends was almost the same as that of biomass, indicating that the two fuels ignited independently when mixed. The thermochemical reactivity of N. Pedio and Mavropigi lignites increased with addition of biomass materials and the fuels showed more or less an additive behaviour upon blending. However, the combustion characteristics of Kandanos lignite/biomass mixtures did not follow those of parent materials in an additive manner, revealing synergy between component fuels.

Keywords: Co-combustion, biomass, lignites

Comparison of Long-Term Broadband Model Results with Experimental Measurements of Solar Radiation

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The environmental degradation has been inevitably imputed to the energy choices that the human has made the last century. The world has realized that there should be a turn to other sources of energy which will have lower or even zero impact to the environment. To this extend a rapid development of solar energy systems has been noticed the last decade worldwide, with the photovoltaic systems' installed power capacity reaching 70GW. It is well known that the energy performance and hence the economic viability of solar power plants strongly depends on the available solar radiation. Moreover, the European Union has realized that there should be a decrease in the annual energy consumption increment. One of the key sectors for the implementation of energy saving policy is the building sector for which the member states had to adopt measures for decreasing the energy consumption. A key parameter for estimating the energy consumption in buildings along with the external temperature is the solar radiation data.

According to the above, there is a strong requirement of solar data in order to accurately size a solar energy system or estimate the energy consumption of a building. On the other hand, there is only a relatively small number of existing solar radiation measuring stations which cannot provide the required data for mapping solar radiation at a large scale. In this context, various solar radiation models have been developed in order to calculate solar radiation components on horizontal surface. An interesting model which has been extensively tested is the Meteorological Radiation Model (MRM) developed by the Atmospheric Research Team at the National Observatory of Athens. The corresponding model employs only common meteorological data (air temperature, relative humidity, barometric pressure and sunshine duration) which are globally available in order to estimate solar radiation.

The present work investigates the reliability of the model's solar radiation estimations in regards to solar energy systems. For that reason available experimental solar radiation measurements for the area of Ioannina, NW Greece, are compared with the respective theoretical solar radiation estimated with the use of MRM which is applied using long term meteorological data. After comparing the results, although the MRM's hourly solar radiation highly differs in some cases (mainly under partly cloudy sky) with the actual measurements, the theoretical monthly and annual solar energy estimations are significantly close to the actual measurements. Therefore, if one takes into consideration the divergence between actual and estimated (theoretical) data, the sizing, based on the MRM, can be accurate.

Keywords: Meteorological Radiation Model, Solar Radiation, Broadband Model

Development of a Greek Solar Map Based on Experimental Measurements

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Solar power systems have been at the forefront of the global energy market for at least a decade now. In the meantime, the world realized that the only environmentally friendly solution concerning power generation is the implementation of renewable energy sources. In this context, following the rapid development of wind energy, solar power systems also presented remarkable market progress. At the same time, rapid increase of photovoltaic systems' installations has been recorded in many European countries, including Greece, where during the recent period the installed photovoltaic capacity doubles almost every two years.

According to the above, there is an increased interest in solar radiation data which plays a key role in the energy performance of solar energy systems. To this end, it must be noted that sizing of similar systems or estimation of their energy yield relies on available data that mainly derive from the application of theoretical models and less often from the exploitation of real measurements. However, theoretical models do not always take into account the microclimate of the area, resulting in deviations which can be critical for the economic viability of the installation.

In this context the present work aims to assess the availability of reliable solar radiation measurements, both long term and short term, conducted by public or private organizations, educational institutes and research centres, as well as by individual actors, for different areas across the Greek territory. The dataset collected is currently evaluated through a procedure of cleaning and gap filling (only where this is permitted) resulting in an updated database of solar radiation for the entire Greek region. Finally, a detailed solar energy map is developed based on the collected data, and is accordingly compared with solar energy maps currently available, designating the importance of appreciating a reliable and comprehensive dataset of solar radiation measurements.

Keywords: Solar Power Systems, Solar Map, Solar Radiation Data

Investigation of the Environmental Impacts of Hydroelectric Power Plants Using Remote Sensing Technique

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Result of the population growth, urbanization, industrialization and globalization demand for the energy increased rapidly. Energy is definitely evaluated as a major factor for the progression and development of societies.

Energy requirements because of the effect of intensive industrialization and increasing population causes the use of fossil fuels such as coal, petrol and natural gas; therefore the greenhouse effect occurs and the earth's surface temperature increases. The threat of global warming and climate change and also insufficient energy resources is enhancing the importance of renewable and environment friendly energy sources day by day. Thus, as worldwide, hydroelectric energy becomes more popular energy source in Turkey. On the other hand, environmental organizations assert that private firms disregard scientific criteria, watershed planning and thoughts of local community so these firms cause environmental degradation.

In this study, environmental and social impacts of completed and uncompleted hydroelectric power plants constructions were searched by considering geographical location, topography, climate, forests, springs, energy sources, socio-cultural environment and disasters in Giresun city and its surroundings were investigated using two different Landsat satellite imageries at 2006 and 2012 in the similar seasons. Using these data, the changes in water resources, agriculture and forest lands after the constructions of the hydroelectric power plants were analyzed by obtained results were visualized based on digital image processing techniques. In conclusion; the negative effects of the hydroelectric power plants on the environment such as reduction of agricultural and forest lands and also water resources were observed using remote sensing technique.

Keywords: Hydroelectric power plants, remote sensing, digital image processing

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Soil pollution and control

Accumulation and fractionation of trace metals in a calcareous soil amended with municipal solid waste compost

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A field plots experiment was carried out to assess the effects of repeated of municipal solid waste compost in comparison to farmyard manure on the accumulation and distribution of trace metals as well as organic carbon and nitrogen in Tunisian calcareous soil.

Compared with untreated soil, the application of two organic amendments significantly increased the organic carbon end nitrogen contents of the soil. Particle-size fractionations showed that carbon and nitrogen were mainly found to occur in the macro-organic matter fraction (80%). The two organic amendments significantly increased organic carbon in the macro-organic and mineral>150μm fraction and the 150-50μm fraction, as well as the organic nitrogen in 150-50μm and macro-organic fraction.

Compared with farmyard manure, municipal solid waste compost significantly increased total Cd, Cu, Pb and Zn contents in the topsoil. These trace metals were mainly present in the macro-organic matter fraction. Significant increases of Cu, Zn and Pb were detected in the 150-50μm<50μm and macro-organic fractions after application of municipal solid waste compost. A significant increase of Cd content was only observed in the 150-50μm fraction. The trace metals also showed different fractionation patterns when the BCR sequential extraction scheme was applied on untreated and compost-treated soil. The residual fraction was found to be the major fraction, especially for Cu, Cr, Ni and Zn. In contrast, Cd was mainly present in the acid-extractable and reducible fraction, whereas Pb was mainly associated with the reducible fraction.

Keywords: Municipal solid waste, organic carbon, trace metals, BCR sequential extraction, Particle-size fractionation.

Behaviour of the Herbicide aminocyclopyrachlor in a loam-silty Soil after Amendment with Biochars and Alperujos

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The aminocyclopyrachlor herbicide was aproved by the US-EPA for its use in non cultivated areas, greens and non residencial gardens. This herbicide with a pKa 4.65 presents an anionic character at the pH of most soils. The anionic compounds are weakly retained by the active soil components and hence they are easily transported to different compartments. In this context this herbicide could not be active in the target plants and be transported to ground and /or surface waters. In order to increase the retention of aminocyclopyrachlor by soils some organic amendments like "biochars" and "alperujos" from different industrial sources and prepared in different ways could be added. Lab experiment on adsorption-desorption of herbicide by amended soils were performed and compared with the corresponding unamended soils and with an active carbon amended soil. The higher herbicide sorption was observed in the soil amended with active carbon. On the other hand, the herbicide sorption only increased in soils amended with biochars originated from wood pellets. The adsorption reversibility of aminocyclopyrachlor herbicide was very low and generally inversely correlated with the adsorption capacity of amended soils.

Keywords: Soil,herbicide,biochar,alperujo,amendment,sorption,hysteresis

Importance of Phosphogypsum in the reduction of salt stress effects on young olive trees (*Olea europaea* L. cv. Chemlali)

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The efficiency of phosphogypsum (PG) in reducing the adverse effects of salinity was investigated on young olive tree (*Olea europaea* L. cv. "Chemlali") grown on salinity conditions. The olive plants were subjected to two salt stress treatments (0 and 200 mM NaCl) and supplied with different PG levels (0, 0.2, 0.5 and 1% PG). In both treatments, olive plants were irrigated twice a week with tap water. After six months, shoot and root dry matter, Na+, Ca2+, K+ and P nutrition, chlorophyll content and heavy metal accumulation were determined. Our results showed that at 1% PG supply, biomass production was increased significantly in roots as in shoots of non salt-treated plants. Biomass production was associated with higher Ca2+ and P uptake in both shoots and roots, while lesser impact was observed for K+.

In addition, chlorophyll and carotenoid contents seem to be improved significantly by PG amendment. By another way, Phosphogypsum supply, under saline conditions proved to be effective in improving nutritional status (Ca2+, P and S contents) in both rooting and aerial organs as well as chlorophyll and carotenoid contents in leaves.

In our conditions, Na+ accumulation in different organs of plants, subjected to salt and phophogypsum combination in the rhizosphere, decreased with increasing the PG level. In salt stressed plants, Na+ accumulation in leaves decrease as PG level increased. This suggests the possible mitigation of the deleterious effect of salt stress by the phosphogypsum amendment.

Despite the slight increase in the level of some heavy metals as Pb2+, Zn2+, Cr2+, Cd and Ni2+, the values have not however exceeded the standards. These findings suggest that PG may be considered in the rehabilitation programs of saline ecosystems.

Keywords: Phosphogypsum, salinity, olive plants, Na+accumulation, heavy metal, rehabilitation, saline ecosystems

Railway Related Soil Pollution: the Turin-Lyon High-Speed Rail Case

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Countries within the European Union have different insight in the degree of soil pollution in general and on railway related pollution in particular.

In half of the EU countries requirements for soil protection are a regular part of the license of railroad related activities. In more than half of the countries there is (some) legislation on soil remediation in force for railroad and railroad related activities.

The total number of inventoried polluted railway sites in the nine main EU countries is about 25,500, with a mean of about 2,800 each.

About one third of the railway companies can provide examples of railroad operations being restricted or cancelled because of soil pollution.

The main railway related soil pollution cases deal with:
• spill of dangerous goods,
• building and construction projects,
• ballast
• protection of groundwater.

More than two third of the companies can give examples showing authorities prescribing an investigation of soil pollution or a soil remediation before a railroad operation.

The case of the high-speed railway proposed for the connection of Turin (Italy) and Lyon (France) is addressed in the paper. Main soil pollution problems dealing with the railway construction are addressed. The case due to the presence in the Susa Valley of geological formations with asbestos and uranium is of particular concern, also considering the final destination of the extracted inert. Also, the questions related with local hydrogeology and its perturbations are addressed. The tunnel will be more than 100 km in total, and will pass through zones with high presence of asbestos and uranium. For example, concerning Uranium, it is foreseen that the resulting material from excavations will be disposed of in two open-pit mines in the Valsusa, Meana and Caprie. This would imply the dispersion in the environment of about 3.3 109 Bq of radioactivity coming from Uranium and his daughters, with possible water and soil contamination. Due to the action of meteorological agents, resuspension, wind, such a dispersion implies an exposure of local population to collective doses of several thousands of Sv-person, well above any limit for tolerable exposure.

Keywords: Soil pollution, uranium, asbestos, hydrogeology, High-Speed Rail, Susa Valley

Degradation of Linear Alkylbenzene Sulfonate and Its Effets on Agricultural Soil

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Commercial surfactants have been shown to be beneficial in various technological applications. They are widely used in household cleaning detergents, personal care products, textiles paints, polymers, pesticide formulations, pharmaceuticals, mining, oil recovery and pulp and paper industries. The environmental fate of surfactants has been a subject of high interest. They have long been considered a potential environmental hazard for soil and groundwater due to the large emission of those compounds. Emission of surfactants to soil mainly occurs through irrigation with municipal wastewater and application of sewage sludge. Others sources of surfactants in soil are the application of dispersants for oil spills cleaning and the application of pesticides formulations. Soil environments play a key role in safely assimilating the chemical products of modern society. The bulk of materials associated with consumer products reach soil via the application of sewage sludge to agricultural lands. The rising interest in reusing domestic wastewater for agricultural purpose has increased environmental concern about surfactants in soil.

Linear alkylbenzene sulfonate (LAS) is widely distributed in the environment. Recently, the discharge of municipal wastewater has been shown to be an important route of LAS into the aquatic environment. The aim of this study was to investigate degradation of LAS and its effects on agricultural soil. Field experiments were conducted at Campus of Corlu Engineering Faculty. Field was formed by miller. Commercial formulations of LAS at four rates 2 kg ha-1(L1), 4 kg ha-1(L2), 6 kg ha-1(L3),8 kg ha-1(L4) and control were applied in May 2012. The doses were dissolved in 1 L of water and sprayed in 2 m2 field with a sprayer. Three different plots (triplicates) were sprayed for each dose. A further three different triplicate plots were sprayed with water (L0), and maintained as control. The experiment was organized as a trial design with divided parcels in randomized blocks with 3 factors. In the analyses of data, four doses of LAS, and three application times were considered as factors. Soil samples were collected 24 hours (T1), 48 hours (T2), 96 hours (T3) and 30 days (T4) after the application, and extracted for LAS residues. Analysis of the LAS was performed using MBAS method in soil extracts. LAS content significantly increased in comparison to control samples. The effect of LAS doses on the soil was statistically (P< 0.01) significant. The LAS residues were significantly (P< 0.01) reduced in samples collected 24 hours and 30 days of the following the LAS application. The present study is a part of a Scientific Research Project (NKUBAP.00.17.YL.11.03 running since 2011.

Keywords: Surfactants, linear alkylbenzene sulfonate, agricultural soil.

Hardpand as a way to reduce the pollution on soils and water in mine areas

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Iron oxy-hydroxides are very reactive materials and they are common phases in hardpans and cemented layers. In this work we study the natural formation of hardpans in several mining-waste materials rich in Fe oxy-hydroxides and their effectiveness in the fixing of trace elements.

Several samples of surface hardpans were collected from mining waste dumps composed, respectively, of gossan, roasted pyrite ashes (RPA) and Fe-rich tailings, from Riotinto mines (SW Spain). Sample characterization was carried out through particle-size distribution, surface area (BET method), mineralogy (X-ray diffraction, XRD, scanning electron microscopy, SEM) and geochemistry (X-ray fluorescence, XRF, and micro-energy dispersive XRF).

Hardpan on RPA is composed of hematite and poorly crystalline iron oxides (Fe_2O_3 = 69.54-76%), with minor quartz and barite. Trace element concentration reached up to 6991 ppm Pb and 424 ppm As, particularly at the most consolidated layer of the hardpan, where As, Pb and Cu precipitated in the matrix associated to poorly crystalline iron oxides. Under this layer, a very porous and friable level displayed the lowest concentration in Fe and trace elements. Hardpan on gossan is composed of hematite, goethite, quartz and amorphous iron oxy-hydroxides, and minor muscovite and barite. The surface layer of the hardpan was enriched in Fe and trace elements compared to the deeper one (Fe_2O_3 = 64.2%; As = 3103 ppm, Pb = 3501 ppm). A micro-XRF scan showed As and Pb associated to iron in the matrix. Hardpan on tailings was composed of quartz, goethite, jarosite and chlorite, with Fe_2O_3 = 35-40% and trace element concentration up to 2640 ppm Pb, 1393 ppm As and 731 ppm Cu.

The natural formation of hardpans on waste dumps is a consequence of several processes, such as mineral dissolution, capillary transport and secondary precipitation of solutes. This dissolution processes have been clearly shown in the RPA hardpan, which is characterized by its fine grain-size and for having high porosity. This level had the lowest content of Fe and trace elements such as As, Pb and Cu. These dissolved elements tend to rise by capillary transport and precipitate at a higher level, where the accumulation of iron and trace elements is produced. Consistently with these results, in the gossan hardpan, Fe and trace element migrate from the lower to the higher level, where they precipitate and are stored. The association As-Pb-Fe in the matrix of the hardpan is also clear in the surface level, where the precipitation occurs. In conclusion, wastes rich in iron oxy-hydroxides are very reactive and tend to form a hardpan. Two clear horizons were found in investigated materials: a deeper one showing dissolution processes; and the upper one with the precipitation of iron oxy-hydroxides after capillary transport, which increase the retention capacity of trace elements.

Knowing the processes involved in the formation of hardpands can assess the possibility artificial creation of these in order to reduce pollution in some areas and prevent the release of trace elements to the water and / or near soils

Keywords: Hardpand, pollution, soils, mine waste

As, Hg and Se contents in the alluvial sediment and mud samples after conventional, microwave and ultrasonic techniques of BCR sequential extraction

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The purpose of this study was to fractionate and examine the levels of As, Hg and Se and mobility of these contaminants in the alluvial sediment and mud samples by three different extraction techniques, in order to compare and determine the degree to which the ecosystem is harmed by these pollutants. Sediment and mud samples were gathered from and around the Petrochemical Industry Pančevo. The BCR sequential procedure was used to extract the metals from the samples using the conventional, microwave and ultrasonic extraction techniques. Microwave oven and ultrasound bath were used as an energy source for achieving faster extraction. Additional heating and boiling of samples were avoided by using lower power and shorter time for microwave and ultrasound extraction. Steps 1-3 in BCR extraction scheme, were completed in: 16 hours in conventional; 120 s with 90 W of microwave power; and 30 min of ultrasound wave's frequency of 42 kHz. The first part of the third BCR step, digestion of organic matter with hydrogen peroxide, for all techniques was done in the same way. The fourth step, pseudo-total content was performed in the same way on samples which were in previous three steps extracted by conventional, microwave and ultrasound technique [1]. Arsenic and Se are dominantly extracted in the fourth step. The most dominant extraction of Hg is the third step (digestion of organic matter) and the largest proportion of organically bound Hg is gained after ultrasonic extraction (79% of total extracted quantity of Hg in conventional, 67% in microwave and 90% in ultrasound sequential extraction). Parts of the first two fractions of Hg (ion-exchange and / or carbonate bound, and adsorbed to Fe and Mn oxides) after all three techniques of extraction are uniform. For As and Hg the highest total extracted quantities, after all four steps, were obtained after conventional sequential extraction. But, the highest total extracted quantity of Se was achieved by microwave sequential extraction and the obtained quantities: 0.03 mg/kg after conventional, 0.04 mg/kg after microwave and 0.02 mg/kg after ultrasound extraction were lower of the range of the abundance of Se in the Earth crust (0.05-0.5 mg/kg [2]).

The total extractable concentration of Hg in investigated samples after three extraction techniques (9.1 mg/kg after conventional, 6.0 mg/kg after microwave and 8.7 mg/kg after ultrasound extraction) are higher than MAQ (Maximum allowed Quantity, for Hg in soil, MAQ value is 2 mg/kg [3]) while for As are lower (MAQ for As in soil is 25 mg/kg [3]). Based on mercury content in sediments and mud samples and results of sequential extraction it can be concluded that on the studied localities there is Hg contamination.

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Environmental effects of atmospheric particulate matter derived from mine wastes upon the air quality and the soils of the Riotinto region (Huelva, Spain)

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The Riotinto mining area (SW, Spain), represents a very high level of anthropogenic contamination, at least partially caused by the accumulation of large volumes of mining wastes which have not received any attention. Previous studies have made it clear that these residues can affect both directly and indirectly the quality of the agricultural and forest soils of that zone. Also, they have made it clear that the atmospheric particulate matter (APM) proceeding from the dumps could be an important pathway of atmospheric pollution. Bearing in mind this problem, the aim of this work is to investigate the influence of the APM derived from mining wastes upon the air quality and the contamination effects upon the agricultural soils of the zone. The methodology involved the sample collection of tailings, soils and particulate matter (APM) in deposition and suspension. There has been a mapping of the different types of materials presents in waste dumps, in order to define potential sources of contamination and assess its potential for contamination. Laboratory work has involved the mineralogical and chemical characterization of soils, tailings and the APM and the determination of trace elements.

The dumps, with the highest pollution potential, are formed by residues from pyrites and roast pyrites. Have a high content of potentially toxic trace elements such as As, Pb, Zn, Ag, Cd and Tl. The mineralogical composition of the soils is: quartz, feldspars and phyllosilicates. There are high correlations between Cu-Pb-Zn-As (r> 0.80) and Fe2O3-As-Co (r>0.79). Agricultural soils are those that have the highest levels of As (204ppm) Cu (586 ppm), Pb (600 ppm) and Zn (800 ppm).

APM samples consist of phyllosilicates, quartz, feldspars and accessory phases (apatite, barite, ilmenite and monazite). The particles of metal sulfides (pyrite and chalcopyrite), iron oxides and sulfates (gypsum and jarosite) were also present in PM10. Annual mean concentrations of trace elements in PM10 environmental interest such as As (1.3 ng m-3), Ni (2.1 ng m-3), Cd (0.1 ng m-3) and Pb (5, 2 ng m-3) were lower than the target values of the European Directive 2004/107/EC (6 ng As m-3, 20 ng Ni m-3 and 5 ng Cd m-3, EU 2004) and 2008 / 50/CE (500 ng Pb m-3, EU 2008). Low levels of metal concentration may be due to the layers cemented by iron oxides (hard-pand) that are common in inactive mine tailings of massive sulphide. The results indicate that the influence of particulate matter in the anomalies detected in agricultural soils of the area is not very marked, due to low metal concentration levels detected on the filters studied. Therefore we can conclude that the air quality in the zone is not today associated with health risks. With these results, it was possible to obtain the geochemical background particulate material in the area, which can be affected if mining resumes in the area in the near future.

Keywords: Atmospheric particulate matter, mine wastes, air quality, soils

Detection of mercurial pollution in the soils and sediments of the Azzaba area (N.E. Algeria)

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In Algeria, problems of environmental pollution constitute one of the concerns of the State where several laws related to this plague were adopted and are in progress application.

In the area of Azzaba, existed an acute problem of environmental pollution with its components (air, soil, water, fauna and flora) caused by the atmospheric emissions and the waste mercury effluents emanating of the complex mercurial before its closing, established not far from this agglomeration. To evaluate this form of pollution our study was based on the mercury analyse in a certain number of samples of soils and sediments taken in various sites of the area of Azzaba.

The method of mercury analysis used is the atomic absorption spectrometry in cold steam (MAS 50). The results shown that the dosage of mercury revealed that one of the samples of soil is more contaminated with a content of 51,52µg Hg / g of soil. The weakest content is 2, 15 µg Hg /g of soil found in some samples. The strongest mercury contents are those recorded in the sites near the factory.

Keywords: Mercury - pollution - soil - sediments - Azzaba

Effect of zeolite and halloysite on accumulation of trace elements in maize (*Zea mays* L.) in nickel contaminated soil

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The soil, as the external layer of the lithosphere, is especially prone to the negative influence of these disadvantageous factors. Soil contaminated with heavy metals, including nickel is one of the consequences of an intensively developing civilization is the contamination of the natural environment. Soil polluted with heavy metals is most often recultivated by the addition of sorption materials. Halloysite is a loamy mineral material which possesses the ability to adsorb organic contaminants as well as the ions of heavy metals. Zeolites are characterized by a well-developed specific surface area, greater than that of humus and other fine-grain minerals known as particle or molecular sieves. Taking the above into consideration, studies aimed at determining the reaction of maize, an important crop in agriculture which has recently been suggested as a candidate species for Ni phytoextraction.

The impact of adding zeolite and halloysite (raw and engeenering) to soil contaminated with nickel on the content of selected microelements in maize (*Zea mays* L.) was assessed under the conditions of a pot experiment. The experiment was conducted in three repetitions, using random assignment. Doses of nickel in the amount of 0 (control), 80, 160, 240, 320 mg•kg-1 soil were introduced in the form of chemically pure aqueous solutions NiSO4. 7H2O. Maize (*Zea Mays* L.) of the San variety was the plant of choice for the experiment. The maize was picked following 69 days of vegetation, during the phase of intense stalk growth. In the collected plant material, the above ground plant yield were determined for each of the pots. The total content of trace elements (Ni, Cr, Zn, Cu, Pb and Mn) was determined in extracts obtained upon mineralization in nitric acid in a MARS 5 microwave oven (CEM Corporation, USA), in HP500 Teflon dishes by means of the FAAS method on a SpectrAA 240FS spectrometer (VARIAN, Australia) using a Sample Introduction Pump System (SIPS). The dose of the contaminant (Ni) and the addition of zeolite as well as raw and modified halloysite were shown to have a significant influence on the amount of nickel, lead, zinc, chromium, copper and manganese in the above-ground parts of maize. The application of zeolite and modified halloysite significantly reduced the content of nickel and lead in the above-ground parts of the tested plant. Soil contamination of 240 mg Ni. kg-1 in the control series (without additives) led to the highest increase of Zn content in maize. When contamination reached a level of 320 mg Ni. kg-1, the content of the chromium was over twice higher than in the non-contaminated plant material. The conducted studies indicate that the application of substances which counteract soil contamination (zeolite, row and modified halloysite) had a positive effect on microelements content in above-ground plant mass. The addition of neutralizing substances also had a positive influence on the average nickel, lead and manganese content in above-ground parts of maize. Zeolite, row and modified halloysite negatively influenced the average content of copper in the plant mass.

Keywords: Zeolite, halloysite, heavy metals, soil contamination

Screening of heavy metal accumulators plant species in the vicinity of polluted areas in Sfax region-Tunisia

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The Posphate Fertilisers producing Factory (SIAPE), Lead smelter and the traffic carried along the Road (GP1) are currently the main sources of metal pollution in the southern suburbs of Sfax. Soil and plants, grown in the immediate vicinity, are receptors of air and particulate pollutants given off by these sources. In an attempt to remediate contaminated soils by phytoextraction of heavy metals process, samples of soil and plants were taken up and analyzed in order to (i) characterize soil contamination level, on the one hand and (ii) screen among, wild and/or ornamental species, those accumulating heavy metals in order to use them in further phytoremediation programs on the other hand. Our results seem to confirm the contamination of soils by cadmium, lead, Nickel, zinc and Copper.

To survive in such restrictive conditions, collected plant species seem to develop various strategies of metal accumulation. Some species showed a preferential accumulation of metals in their aerial parts as the case of *Solanum nigrum*, *Conysa canadensis* and *Ononis natrix*. Others proved to be metal accumulators in the root system as the case of *Bassia indica* and *Malva aegyptiaca*. Thanks to their absorption and translocation capacity, some species as *Bassia indica* and *Ononis natrix* proved to be accumulators of metals in both aerial and root parts. However, this accumulation appears to be specific and dependent on the affinity between the species and the metal. As a case in point *Bassia indica*, *Ononis natrix*, *Arthrocnemum indicum*, *Conyza canadensis* and *Malva aegyptiaca* appear to be accumulators respectively of Cd, Pb, Ni, Zn and Cu. This ability to accumulate heavy metals displayed by these species, allow them to be used in phytoremediation programs.

Keywords: Accumulator, phytoremediation, contaminated soils, heavy metals, *Solanum nigrum*, *Ononis natrix*, *Conysa canadensis*,

Effects of Freshwater Pollution in *Lemna minor* L. Exposed in Bags in a Polluted River of South Italy

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Environmental pollution of air, water and soil is a major issue for human health. Poisoning of freshwaters is of special concern, since rivers may transport contaminants away, even to areas far from any pollution source, thus dangerously modifying uncorrupted biosystems.

Plants reacts to pollutants in a highly complex way, activating a number of parallel and/or consecutive pathways at molecular, physiological and morphological levels.

Most of duckweeds (Lemnaceae) are species widely used as model hydrophytes in ecotoxicology due to their wide distribution, fast growth, short life span, and sensitivity to environmental changes. This study aimed at evaluating biological effects of freshwater pollution in the highly contaminated river Solofrana (Campania, Southern Italy), using bags containing the aquatic duckweed Lemna minor. Homogeneous samples, collected at the Botanical Gardens of the University of Naples, were accurately washed and disposed in nylon bags (1 mm2 – mesh). The bags were exposed for one week at 25 cm of water depth in the river, to determine morpho-physiological and genetic modifications as a response to pollutants. A number of parameters were measured and observed on these samples: heavy metal accumulation, ultrastructural organization, HSPs induction and repetitive DNA organization. The genotoxicity potential of polluted waters and the determination of type of cell death have been assessed through DNA laddering and AO/EB double staining assay.

The results showed that *L. minor* is very effective in accumulating heavy metals. Morphological alterations concern overall chloroplasts (shape and thylacoidal organization) and vacuoles. HSPs, repetitive DNA and genotoxicity were influenced by exposure. The results suggest the possibility of using this species and this method both in biomonitoring and phytoremediation projects.

Keywords: *Lemna minor*, Bioaccumulation, Freshwaters, Italy, Pollution

Effects of air pollution on hsps induction and antibacterial activity in *Feijoa sellowiana* berg. grown in the "italian triangle of death"

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Anthropic activities have dramatically increased pollution of the biosphere. Use of selected plants to bio-monitor the environmental pollution is one of the most interesting prospective. In the presence of pollutants, plants can undergo biochemical alterations, giving response phenomena. Alterations of the protein or gene or enzymatic pattern have been recently regarded as pollution biomarkers, being early signals of response to environmental stress.

Our research group is exploiting some plants to detect the effect of air pollution on the production of antibacterial, allelopathic and antitumoral substances. The urban district of Acerra (Naples, Southern Italy) is one of the vertexes of the "Italian Triangle of Death", the area in Italy with the highest cancer incidence, probably due to high levels of air pollution (Senior and Mazza 2004).

Feijoa sellowiana Berg. (syn. *Acca sellowiana*) is an evergreen bushy shrub member of Myrtaceae family, native to extreme southern Brazil, northern Argentina, western Paraguay and Uruguay. Different biological activities of *F. sellowiana* fruits have been reported: antioxidant; antibacterial; cytotoxic; anti-inflammatory and anti-cancer activities on solid and hematological cancer cells.

In this study we compare the antibacterial activity on eleven bacterial strains and HSPs induction in fruits from *F. sellowiana* grown in the district of Acerra with others coming from unpolluted sites. Such methodology could represent a starting point for the development of new biomarkers in air-pollution.

Keywords: *Feijoa sellowiana*, air pollution, antibacterial activity, allelopathic and antitumoral substances, "Italian Triangle of Death"

The effect of clinoptilolite addition on potassium release from sandy soil treated with compost

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Soil erosion, salinization, and nutrients depletion are among the main environmental problems facing mankind today. Sandy soils which are both widespread and host agriculture activities are also, due to their low clay and organic carbon content and low water stable aggregates content, prone to nutrient loss and structure instability. Several techniques, focusing on soil preservation, have been proposed including the application of agricultural residues or municipal waste. The use of compost as a soil conditioner has been widely studied during the last 10 years. However, the application of compost in soil has been found to increase orders of magnitude the electrical conductivity in soil solution and its content in nutrients like potassium. The present study investigates the effect of clinoptilolite on potassium release from sandy soil treated with compost. Batch and column experiments were conducted to study potassium adsorption onto soil, compost, and clinoptilolite surfaces. The influence of pH on the sorption process, in batch conditions, was investigated. The results showed high affinity of potassium to clinoptilolite for pH>7. The kinetic experiments showed that the clinoptilolite addition had no significant influence to potassium desorption rate while it resulted in 15-fold increase in the bio-available potassium. The column tests showed that the application of clinoptilolite resulted in 5-fold and 1.8-fold decrease in potassium leaching depending on the practice followed for the clinoptilolite addition to the soil (recoverable or not), while it proved to have no effect on the release of nutrients like nitrates and phosphates. It is therefore concluded that the clinoptilolite addition to compost treated sandy soils can enhance the retention of bio-available potassium and minimize the nutrient loss towards groundwater.

Keywords: Potassium leaching, clinoptilolite, adsorption, compost, sandy soil

Characterization of heavy metals accumulation in polluted soil in an industrial zone in Sfax city during two critical periods

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In recent decades, as a result of the increased industrial activities, environmental pollution has become a major problem which affects almost the entire world. In Tunisia, The Industrial Society of Phosphoric Acid and Fertilizers (SIAPE), located at 5 miles from the south of the city centre of Sfax, is currently the main source of air pollution in Sfax city.

Our study focused on the effects of air pollution on the ground through the determination of the levels of heavy metals namely, cadmium, lead, zinc and copper at the different levels of the substrate and their relationship with different physico-chemical parameters during July and April periods representing two different seasons (summer and spring) in polluted and non polluted soil (located at 0.5km, 5km, 10km and 30km from the industry).

Analyses of the different physicochemical and mineralogical parameters of the soil in comparison with those of the control soil have enabled us to see a considerable reduction in the levels of heavy metals during the spring season (April 2011) if compared to the summer one (July 2010). In addition, the study of the distribution of the various concentrations of the metals at the different horizons allows us to detect that these concentrations decreased with the distance from the transmitting source and with the depth. Our data showed also that an acid pH appears to favour an increase of these pollutants at ground level, as well as its mobility. Similarly organic matter seems to play an important role in the complexation of these pollutants by its adsorption on mineral and organic colloids. Furthermore, the results of analyses of the various correlations, confirm the complexation of heavy metals with various organic and inorganic molecules.

Keywords: Air Pollution, heavy metals, mineral elements, organic matter, soil characteristics.

Total petroleum hydrocarbons dissipation efficiency of two Pseudomonas strains isolated from diesel contaminated soil in Cyprus

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Microbial degradation is the major and decisive natural mechanism for the removal of petroleum hydrocarbon pollutants from the environment. Bacteria are the most active microbes in petroleum degradation acting as primary degraders of spilled oil in environment. A diesel polluted soil was used also for the enrichment and isolation of potential hydrocarbon – degrading bacteria. A total of, 14 strains of Pseudomonas like bacteria were isolated, identified and tested for their ability to degrade total petroleum hydrocarbons (TPH). Two Pseudomonas isolates designated as el20 and el15 respectively were able to readily degrade TPH and n-alkanes. Phylogenetic analysis based on a 16RNA gene sequencing revealed that strain el20 and el15 had high similarity with *Pseudomonas otitidis* and *Pseudomonas stutzeri*. Our in vitro studies showed that both isolates (el15 and el20) exhibited high TPH dissipation rates (t1/2 12 and 7 days respectively). Despite their ability to dissipate rapidly TPH, the two strains were differentiated by their ability to dissipate different n-alkane fractions. Isolate el15 showed a significantly higher dissipation rate than el20 isolate regarding the dissipation of $\Sigma nC15$-17, $\Sigma nC18$-21 and $\Sigma nC21$-25 n-alkane fractions. A bioaugmentation experiment was followed demonstrating that the use of these isolates for the bioremediation of a heavily polluted soil in situ was successful.

Keywords: Soil pollution, bioderemediation, petroleum hydrocarbons, *Pseudomonas* sp.

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Waste management

Sustainable solid waste management in megacities

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Waste management in megacities, which are defined by the United Nations as a metropolitan area with a total population of more than 10 million people, is a challenge for today and the future. More than 600 million people are expected to live in megacities worldwide in the year 2015.The problems of a megacity include high population concentration and density, uncontrolled spatial expansion, high traffic, infrastructural deficits (also in waste management), high concentration of industrial production, ecological overload, but also very often insufficient housing and extreme socio-economic disparities.

Waste management makes an important contribution in confronting current and future global challenges of economic development, be it climate protection, resource conservation, or in terms sanitation and public health protection. Modern waste management should address the three pillars of sustainability, including economic, environmental and social factors equally. This necessarily means that there is no generic solution for the various countries, regions, and municipalities, and instead, successful solutions depend on being tailored to the local conditions.

Regarding the material recycling, new challenges are emerging. While recovery systems for ferrous and non-ferrous metals, paper, glass, textiles, and, to a lesser extent, for plastics have been established, valorization of organic waste stills offers a large potential for improvement. On the one hand, in many countries biowaste corresponds to the largest fraction of municipal solid waste (MSW), but to a large extent it remains unrecovered. Here composting and anaerobic digestion provide good alternatives for the recovery of nutrients, organic matter, and energy (biogas) from source separated biowaste. Through the use of compost and sludge chemical fertilizers can be substituted, and the quality of soils can be improved. Furthermore, biorefineries for biowaste will prove to be in the mid-term a viable option.

An additional challenge for the future will be the recovery of rare and critical metals, which are abundant in Waste from Electrical and Electronic Equipment (WEEE), but cannot currently be recycled, as is the case for example for niobium (Nb), tantalum (Ta) and Germanium (Ge) and other more than 10 critical metals. These metals are of strategic importance, since only a very few countries posses deposits of these elements and the market is controlled by a handful of companies. In order to achieve higher recovery rates of these materials, new systems, for example product leasing or deposit schemes, need to be considered, as the financial viability of their separate collection and recovery is limited. In the medium term, electronic devices and end-of-life vehicles (ELV) exported to developing countries will need to be reimported, in order to avoid environmental damages in these regions and at the same time recover, to a high grade through technical process, the valuable substances contained.

Another current topic involves the recovery of phosphorus from wastewater sludges, since the natural reserves of phosphates are to a large extent depleted. This can be evidenced to some extent in the high global market prices for phosphates. In addition to the application of sludge in agriculture, the reclamation of phosphorus from sewage sludge ashes is an innovative recovery method.

For the implementation of sustainable waste management systems for megacities the following steps are necessary:
- Model-based strategic planning and development of integrated waste management concepts, which respect the local economic, social and environmental conditions.
- Targeted separate collection of valuable materials, which are supported by instruments such extended producer responsibility (EPR) and deposit-refund schemes.
- Pretreatment of residual waste for disposal, in order to minimize the negative environmental impacts of wastes with high organic matter contents (e.g. through landfill gas and leachate) and to rapidly bring the landfill in equilibrium with the environment (e.g. reduce the burden on future generations).
- Complete treatment of hazardous waste in treatment plants with the best available technologies.
- Education and training of staff in enterprises and public administration.
- Awareness raising of the general population, which should begin with the environmental education of children and should involve the important topic of waste avoidance and minimization.
- Financing of planned measured need to be secured. Especially in developing economies new economic instruments and financial schemes need to be created.

In the keynote presentation the aforementioned topics will be illustrated with the help of examples and diagrams.

Urban municipal waste flows in the Mediterranean area phase 2: moving from less landfilling to more recycling

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Faced with the expected influx of almost 100 million additional town-dwellers in the countries bordering the Mediterranean by 2025, concentrated mainly on the Southern and Eastern banks (from Morocco to Turkey), promoting sustainable urban development has been deemed crucial to sustainable development in the Mediterranean. Two in every three people in the countries surrounding the Mediterranean are already urban dwellers. By around 2050 the urban population in the countries on the European shore is likely to stabilise at around 170 million (140 million in 2005), whilst to the South and East it is expected to double to reach over 300 million (151 million in 2005).

To the « North », the legal EU requirements have pushed the countries to opt for gradually abandoning landfilling and move up the waste hierarchy, including recycling and composting. To the "South", cities have engaged in optimizing waste collection coverage and are in the process to close open dumps, rehabilitate uncontrolled landfills and built new sanitary landfills. Virtually all the waste collected nowadays in the "south" ends up in landfills. It is estimated that the proportion of municipal waste collected for recycling or composting hovers around 5% of the amount generated in most southern countries. Moving from landfilling to waste management options higher up in the waste hierarchy contributes to a considerable reduction of greenhouse gases.

Burgeoning waste is opening up new prospects, particularly for recycling. The recycling industry can actually be regarded as a major component in an environmental industry. Waste provides the raw material for some economic, agricultural, craft or industrial activities and exploiting this potential may have a positive impact on the entire waste management chain and beyond (creating jobs and financial resources). This could result in waste being treated as a tradable product with economic value. Collecting and transporting municipal waste, treating and disposing of waste on landfills but also reuse/recycling systems provide considerable investment opportunities for the public and private sectors alike.

Although some (public)/private systems exist in certain countries for the collection and sorting of specific types of waste (metal, plastic bottles, etc.), volume is still limited and the focus is on the most easily recoverable waste. In most countries to the South and East of the Mediterranean, recycling systems are still in their infancy. Besides recycling, waste reduction and reuse (3R) play an important role within integrated sustainable waste and resource management.

Even though often neglected and disregarded, the informal sector plays a significant role in urban waste 'selective' collection and recycling. This urban service can only be improved on a sustainable basis if the means already available in the towns are better exploited and stakeholders in this sector therefore fully integrated into the urban economy. Artisanal collection needs to be combined with an effective treatment system in order to encourage economies of scale in core investment (landfills, biogas production plants, recycling systems, etc.).

Keywords: Recycling, 3R, closing the loop, informal recycling sector

Risk assessment of four uncontrolled landfills in Greece before and after their closure

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The overall objective of this work was to assess the risk of four uncontrolled landfills in Ipeiros, Greece, before and after their closure. The four landfills were: (1) Neohorion, (2) Nikopolis, (3) Filiates and (4) Konitsa. They were selected because they represent different amounts of disposed of waste and different sitting cases. Specifically, the Neohorion landfill is located in a lowland area and contains 10500 tons of solid waste left. The Nikopolis landfill is located in permeable soil at the slope of a hill, and contains 125000 tons of solid waste left. The Filiates landfill is located in a limestone area at the slope of a hill and contains 23000 tons of solid waste left. Finally, the Konitsa landfill is located inside a river bed and it contains 183000 tons of solid waste left. For risk assessment, the Evapassold method was used, applying the formula $R = R_o f(L/S) f(G)$. R is the overall risk and Ro refers to the landfill's historical background and its value is estimated taking into consideration the kind of waste disposed. The $f(L/S)$ factor is a function of the L/S, which is the ratio of liquid to solid and is associated with the age and the biochemical stability of the waste. Finally the $f(G)$ factor takes into consideration the general environmental condition and usage of the area. The results showed that the waste in each landfill was washed to a high degree, because L/S>5, thus, significant emissions to the atmosphere, surface water and groundwater had already taken place. Complying with Greek regulations, landfill operation has ceased since 2011, however, the risk value is still R>1, indicating that some kind of remediation may need to be applied.

Based on the preliminary risk assessment results, the following remediation alternatives were proposed for each landfill: (1) Final cover 1.5 m thick, containing natural soil. (2) Final covers containing a flattening zone, a clay liner, a drainage collection zone and a soil vegetation zone. (3) Final covers containing a flattening, a clay liner, a drainage collection zone and a compost zone for methane oxidation and plant growth. (4) Final covers containing a flattening, a composite liner (HDPE geomembrane + clay), a drainage collection zone and a compost zone for methane oxidation and plant growth. The Evapassold method was applied and risk was calculated for 30 years of aftercare.

The simulation results showed that small amount of water percolation would continue, even after application of remediation alternatives. As a result, the ratio L/S would increase and the $f(L/S)$ would maintain the constant value of 0.5 with time, independent of remediation alternative. Therefore, the calculated risk value was constant with time, but still R>1, indicating the need for some kind of further waste stabilization. This suggests that there is no need for an expensive coverage technology and simple soil coverage would be sufficient. Thus, the first remediation alternative, i.e., a 1.5 m thick soil cover may be chosen. However, for accelerating biodegradation of the remaining organic matter, a low pressure aeration method could be applied.

Keywords: Risk assessment, uncontrolled landfilling, Evapassold method, Greece

Life cycle analysis of municipal waste management: industrial symbiosis options for reduced ecological footprint

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To date, landfilling remains the most common waste management practice in Greece in spite of enforced regulations aimed at increasing recycling, pre-selection of waste and energy and material recovery. In this paper selected alternative scenarios aimed at minimizing the unused material fraction to be disposed of in landfills are analyzed. The methodological framework of the analysis followed is life cycle assessment. The approach was applied to the case of municipal solid waste (MSW) management in the two larger cities in the country, Athens and Thessaloniki, with a special focus on energy and material balance, including potential global and local scale airborne emissions as well as groundwater and soil releases. Results are given in the form of indices and indicators of efficiency, effectiveness, environmental and public health impacts. Material flow accounting, gross energy requirement, exergy and emergy intensity, local, regional and global emission and release intensity and morbidity or mortality indicators have been used to support the comparative assessment.

Our analysis points out that landfilling is the worst waste management strategy at a global scale. At the same time, the investigated options for waste treatment coupled with energy and material recovery would result in very important benefits in terms of greenhouse gas emission reduction. However, not all options are equally benign to the local environment and to the health of the local population, since both the former and the latter are still affected by non-negligible local emissions. With regard to public health impacts, adverse effects on respiratory health, congenital malformations, low birth weight and cancer incidence were estimated.

A significant and not intuitive result is the fact that life cycle analysis produces different conclusions than a simple environmental impact assessment based only on estimated or measured emissions. Taking into account the overall life cycle of both the waste streams and of the technological systems and facilities envisaged under the plausible scenarios analyzed herein, alters the relative attractiveness of the solutions considered. Furthermore, waste treatments leading to energy recovery provide an energy output that, in the best case, is able to meet a significant but not high percentage of the urban power demand. Thus, industrial symbiosis-based solutions open the way towards the reduced ecological footprint of municipal waste management options.

Keywords: Municipal waste management, life cycle analysis, industrial symbiosis, ecological footprint, emergy, exergy, material flows

Anaerobic digestion of organic municipal solid waste: A valid waste management option

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Solid waste management is a critical problem in Greece and all over the world because of a number of associated environmental and public health problems. This study focuses on the management of the organic fraction of municipal solid waste (OfMSW) using biological methods and in particular anaerobic digestion in order to explore the optimization of the system for energy and material recovery and for greenhouse gas abatement at the urban scale.

According to our experimental procedure the OfMSW was used as a substrate of a system of coupled batch bioreactors. The experimental apparatus comprised four variably coupled anaerobic digesters, a configuration that enabled the simultaneous use of different substrates or different percentages of waste and inoculum. Inoculum from olive mill wastewater was added to the feedstream in order to accelerate the overall process at variable ratios of waste and inoculum. The bioreactors operated under mesophilic conditions (35oC) and continuous mixing for five minutes every three hours. The quantity and quality of the produced biogas was measured in correlation to COD and pH variation. The ideal proportion, which was investigated, was 50% waste-50% inoculum, producing in Standard Temperature and Pressure (STP) conditions, 280.4 mL CH_4/g COD OfMSW treated. In addition, using the volume of produced CH_4, we studied the design of an anaerobic digestion plant coupled to a Combined Heat and Power (CHP) plant using the bioenergy produced. The proposed design was compared against the current situation with regard to urban waste management in Thessaloniki, taking into account the energy balance and the greenhouse gas abatement potential. The energy balance showed that 882.5 MJ/tn OfMSW could be sold to the national electricity grid. Utilizing the produced energy per ton of OfMSW in the case of Thessaloniki, we found that coupling the anaerobic digester system to a CHP plant, producing 157 MW, would be feasible.

On the other hand, the environmental analysis results showed that a reduction in emissions of 1854.4 ton eq-CO_2/ tn OfMSW treated and 0.61 ton eq-CO_2/ MWh can be attained. Emission reduction from the produced heat and power includes the displacement of fossil fuels combustion.

Keywords: Anaerobic digestion, organic waste, municipal solid waste

Recovery of Mercury From Spent Fluorescent Lamps By Electrowinning Process

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The concentrations of harmful and toxic substances released to the natural environment are increased due to rapid industrialization and urbanization. One of the most well-known effects of toxic substances is mercury. It is toxic by inhalation, ingestion and skin absorption with acute and chronic exposure effects including central nervous system and kidney damage. Mercury is also used in lighting products as well as many industrial sectors. Mercury lamps (fluorescent, compact fluorescent, mercury vapor, sodium vapor and metal multi-vapors and mixed) use mercury as a vital component for their functioning. Mercury concentration in these lamps varies considerably depending on the manufacturer, the type of lamp and the manufacturing year.

In this study, electrowinning process was used followed by chemical oxidative leaching to recover mercury from waste fluorescent lamps. For this purpose, T8 and T12 types of spent fluorescent lamps were obtained from different physical plants such as hospitals and schools. The lamps were manually dismantled in the laboratory. The phosphor powders and glass components of the dismantled lamps were pulverized and evenly mixed (50% T8 and 50% T12). The sodium hypochlorite (NaOCl) and sodium chloride (NaCl) were used as chemical leaching reagents to extract mercury from pulverized lamp samples. A 23 factorial design with replicated central point tests was chosen for conducting the leaching tests where the factors were mass/volume (lamp sample weight/leaching solution volume) ratio, leaching reagent (NaOCl/NaCl) dosage, and temperature. The similar factorial design was carried out for the electrowinning experiments. The factors for these tests were pH, time and current density.

The leaching results showed a higher extent of mercury removal (up to 97%) from pulverized lamp samples under the following conditions: temperature 50oC, mass/volume ratio 1/2 and leaching dosages 0.5M NaOCl/0.2 M NaCl.All sets of electrowinning experiments has not been completed. However, as a result of the preliminary experiments, current density and time are the most effective parameters on the efficiency of removal mercury and electrowinning yield observed that over the 85%. In the full paper, the detailed description of the leaching and electrowinning process will be given, as well as the all results including main and interaction effects (performed by analysis of variance – ANOVA using Yates method) of the mentioned processes.

Keywords: Electrowinning, Fluorescent Lamps, Mercury, Recovery

Utilization of fly ash derived through induct desulphurization of flue gases from lignite power plants, in ceramics and cement based materials

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The majority of energy demand in Greece and in many other countries is met by lignite combustion in Power Plants. Our technique of flue gas desulphurization using induct direct solid lime injection, produced large quantities of solid byproducts, such as fly ash containing calcium sulfate. The utilization of such fly ash as a raw material, in the production of clay bricks and cement based products was the scope of the current work. The characterization of the fly ash and the rest of the raw materials was performed by atomic absorption spectrometry (AAS), scanning electron microscopy (SEM), differential thermal analysis and thermogravimetry (DTA-TG) as well as X-ray diffraction (XRD). Ceramic specimens were prepared using different mixtures of clay and fly ash containing calcium sulfate, followed by powder forming, drying and firing. The effect of firing peak temperature and the powder pressing load on the properties of the products was investigated. The specimens were tested for firing shrinkage, water absorption, modulus of rupture, compressive strength and leaching behavior as well. All the tests performed, showed that the ceramics produced are technologically and environmentally accepted. Furthermore, cement based specimens prepared with the addition of the fly ash derived from induct desulphurization, were tested and found also to be technologically and environmentally accepted.

Keywords: Flue gases, induct desulphurization, fly ash, ceramics, cement based materials

Utilization of Mn-Fe wastes from electrolytic MnO2 production in EM shielding ceramics

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Accumulation of unmanaged industrial solid wastes is becoming a major environmental concern. Recycling of such wastes into sustainable construction material emerges as a viable solution against the pollution problem and constitutes an economical option in the design of green buildings. In this study clay based ceramic building materials (bricks and roof tiles) were prepared, by utilizing three types of the same industrial solid waste derived from the production of electrolytic manganese dioxide (EMD). Chemical and thermogravimetric analyses were performed to characterize the industrial wastes and the relevant ceramic clays, while the technological properties and the electromagnetic shielding efficiency (SE) of the prepared building materials was also investigated. Our results demonstrated that the ceramic specimens prepared with the addition of 4% wt, of plain dry, wet and dry treated EMD wastes (DEMD, WTEMD and DTEMD respectively), conformed to EN technological and environmental standards, as set for building materials, in two of the three aforementioned cases. Finally, a ceramic building wall constructed with the addition of DTEMD waste, demonstrated adequate shielding efficiency and absorption performance in the X-band frequency range (8– 12 GHz) although for the respective trial containing plain dry EMD waste (DEMD) this was not the case.

Keywords: Mn-Fe wastes, Electrolytic MnO2, Electromagnetic Shielding, Ceramics

Investigating the biodegradation of starch-based bioplastic wastes by the white rot fungus *Coriolus versicolor*

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Biodegrability of starch-based bioplastic wastes by white rot fungus *Coriolus versicolor* was investigated. The total reducing sugar levels were determined by the dinitrosalicylic acid (DNS) method. Types of sugars obtained from biodegradation of starch-based bioplastics were determined by HPLC. Results of DNS method sugar analyses showed that the reducing sugar levels had a trend of increasing with fungal attack to starch-based bioplastics and the reducing sugar levels had a trend of the decreasing with utilization of these sugars by fungi. HPLC analysis results showed that polysaccharides in the structure of starch-based bioplastics were degraded monomers such as glucose and fructose during the biodegradation period. Experimental studies showed that starch based bioplastic wastes were degraded by the white rot fungi *C.versicolor* and monomers such as fructose and glucose formed as a result of biodegradation.

Keywords: Biodegrability, *Coriolus versicolor*, Starch-Based Bioplastics, White Rot Fungi.

Chemical Treatment of Olive Mill Wastewater: Organic Matter Fractionation

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Oil mill wastewater (OMW) is one of the most complex and heavily loaded effluents and thus of significant environmental concern when discharged into the aquatic and terrestrial environment. Because of its high organic carbon content being primarily composed of a variety of bioinhibitory and polyphenolic compounds the disposal of OMW to water bodies without efficient treatment results in serious environmental deterioration. Until now, most of the treatment applications devoted to OMW appeared to be technically and economically unfeasible for real-scale applications. Hence, it is of vital importance to deeply study the structural and physicochemical properties of OMW and understand the involved removal mechanisms of available chemical treatment processes in order to enhance their performance.

The motivation of the present experimental study was to elucidate the physicochemical changes brought about in an OMW sample (COD=150000 mg/L, TOC=36000 mg/L; TPh=3800 mg/L; oil and grease=8200 mg/L; pH=4.0; acute toxicity as ED50 = 12% v/v) by the application of different chemical treatment processes including ferric chloride coagulation, electrocoagulation using stainless steel electrodes and the Fenton's reagent by structural fractionation analysis. For this purpose, untreated and chemically treated OMW samples were subjected to structural fractionation using XAD-8 and XAD-4 resins for the separation of hydrophobic (acids, bases, neutrals), transphilic and hydrophilic moieties. The OMW sample was always pretreated by acid-cracking with sulfuric acid at 70oC and filtration prior to structural analysis.

The COD and TOC content of the OMW sample was distributed almost equally between the acidic and basic hydrophobic fractions (20-25% each), while a dominant fraction appeared in the hydrophobic neutral fraction (58%) for the TPh parameter. Depending on polarity of the specific organic constituent, a shift in the structural distribution was observed from mainly hydrophobic to more hydrophilic fractions for the COD and TOC parameters. For instance, after employing Fenton's reagent and electrocoagulation, the hydrophobic fractions were removed appreciably, while the hydrophilic content increased by 35%, indicating that the oxidation of hydrophobic substances resulted in the formation of more polar, hydrophilic products. The TPh content of the OMW sample shifted from neutral hydrophobic to acidic hydrophobic by 22-43%, in particular after the application of the Fenton's reagent and electrocoagulation resulting in around 50% TPh removal. Toxicity mainly appeared in the hydrophobic neutral fraction. Considering the TPh parameter which was mainly distributed in the hydrophobic neutral fraction a relationship seemed to exist between these two parameters. However, the inhibitory effect of the wastewater increased from 12% to 70-80% after chemical treatment speaking for the possibility that the TPh content of OMW was not the primary reason of the high toxicity in the treated OMW sample. GC-MS analysis was conducted on chemically treated OMW samples and it could be demonstrated that a major peak existed in the hydrophobic neutral fraction most probably belonging to a sulfur moiety originating from the acid cracking process which was employed for pretreatment purposes prior to structural fractionation. It could be demonstrated that the chemical treatment processes modified the structure of OMW in different ways due to different treatment mechanisms.

Keywords: Olive mill wastewater (OMW), structural fractionation, chemical treatment processes, acid cracking, coagulation, electrocoagulation, Fenton's reagent, acute toxicity, *Vibrio fischeri*.

Evaluation of EU-Coherent Municipal Solid Waste Management Planning in Turkey

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This study is dedicated to determining and evaluating municipal solid waste flows of Turkey with respect to EU-coherent waste management scenarios. The study initially evaluates Environmental Heavy-Cost Investment Planning (EHCIP) Project supported by the European Union (EU) and financed by the Central Finance and Contracts Unit (CFCU), and National Solid Waste Master Plan Project prepared for the Turkish Ministry of Environment and Urban Planning. Within the context, case-specific waste management scenarios were developed for metropolitan and non-metropolitan municipalities with a particular configuration of cities to be evaluated in 4 main groups. The first group consists of 14 metropolitans covering Istanbul, Izmir, Bursa, Kocaeli, Sakarya, Ankara, Antalya, Mersin, Adana, Eskisehir, Kayseri, Konya, Gaziantep, and Samsun, in which most of the municipal solid waste (MSW) will be mixed-collected and disposed of via incineration plants. Here, only a small portion of the packaging waste will be collected separately in high-income areas, while a limited fraction of the biodegradable waste, such as yard trimmings and restaurant wastes, will be treated in composting and/or biomethanization facilities. The second group requires the extension of the 14 metropolitans to include 3 Eastern Black Sea Region cities, namely Artvin, Giresun and Rize to be served with incineration instead of landfilling due to lack of land and inconvenience of site selection, and 2 Eastern Region cities, namely Diyarbakır and Erzurum at which no incineration will be facilitated. Furthermore, at the end of 2012, Turkish Metropolitan Municipalities Law was amended to add 14 new metropolitans which made way for the third group to consist of Aydın, Balıkesir, Denizli, Hatay, Malatya, Manisa, Kahramanmaraş, Mardin, Muğla, Ordu, Tekirdağ, Trabzon, Şanlıurfa, and Van, where a more comprehensive dual collection system both for biodegradable and packaging wastes will take place. The amended law also requires the municipal service boundaries to extent to actual administrative borders of the metropolitan provinces which holds to be valid for all of the above-mentioned groups. Finally, the last group comprises of the non-metropolitan remaining cities in Turkey, in which an effective dual collection system in residential areas is applied, regarding the recovery of biodegradable municipal wastes (BMW) and recycling of packaging wastes at high efficiencies. In this study, the results of EU-coherent waste management scenario are judged against the EU and National waste management acquis in force. The EU Landfill Directive, taking the BMW generated in 1995 as a baseline, requires reducing the amount of landfilled BMW at ratios of 75%, 50% and 35%, respectively for the years 2010, 2013 and 2020. On the other hand, the Turkish Landfilling of Wastes Legislation fully adopted the target ratios only to alter the 1995 baseline to 2005. The BMW landfilling target years have been revised as 2015, 2020, 2025 suitably, while EU and national packaging waste targets hold to be coherent for the year 2020. The current improvements in Turkish waste sector with respect to EU-coherent waste management have been proven to show results as Turkey has drew back from second place to third on the list for national GHG emissions.

Keywords: Municipal Solid Waste (MSW), EU Coherent Waste Management, Waste Flow, Sanitary Landfills

Management Strategies for Reducing the Amount Of Leachate In Turkey

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Leachate treatment is a difficult task as it has significantly higher organic load and less volume compared to municipal wastewater. Therefore, application of appropriate treatment methods is essential. As waste separation is not considerably applied and as poor operating conditions takes place, the amount of leachate arising from the already operating plants in Turkey turns out to be higher compared to other countries. The aim of this study is to identify the parameters affecting the amount of landfill leachate and to develop management strategies targeting the reduction of its amount. Various management scenarios are developed for regions (waste catchments) that serve a population of ~300 000 capita for 20 ha virtual landfills with local climatic properties and by considering certain criteria specific to Turkey. Three different climatic and geographic features that characterize Turkey are taken into account, namely; Malatya (arid region), Çanakkale (close to Turkey's average precipitation value) and Giresun (wet area), for the running 5 main scenarios to determine and investigate the change in the amount of leachate by the application of the simplified water balance method. In these scenarios, by changing the average amount of rainfall, different waste management strategies, different cell sizes and collection type of landfill leachate are evaluated. The main parameters that affect the amount of leachate passing through waste storage cells, the average annual precipitation and evaporation figures unique to each region serve as input data for the simplified water balance method. In addition to the simplified water balance method, the model HELP 3.0 developed by the U.S.A Army Corps of Engineers is used for comparison. Reducing the amount of leachate for minimizing the size of waste cells, applying a final top cover for the landfill based on the regulation, composting of waste with high water content and interfering the access of storm water from empty cells are the main management strategies. As a result of the study, integrated waste management method (highly bilateral collection, packaging, and recycling of biodegradable waste) is proven to be the best practice in decreasing the leachate arising from the sanitary landfills.

Keywords: Leachate, solid waste, water balance method, landfill, waste management

Effect of primary settling on stabilization of biological sludge under aerobic condition

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Excess sludge generated during the biological treatment of wastewater must be treated before disposal. Aerobic stabilization is an important approach for the treatment of sludge. The study was aimed to investigate the effect of primary settling on aerobic stabilization level of treatment sludge originated from municipal wastewater treatment plant in Istanbul. The efficiency of the stabilization was assessed monitoring suspended solids (SS), volatile suspended solids (VSS), total and dissolved organic carbon (TOC, DOC) parameters. Respirometric measurements were conducted for the assessment of biomass activity. Two laboratory-scale fill-and-draw reactors with a working volume of 6 L were operated at a sludge age of 8 days and a hydraulic retention time (HRT) of one day. One of the reactors was fed with raw wastewater (R1) and the other was fed with primary settled municipal wastewater (R2). After acclimation, biomass in the reactors was transfered to stabilization reactors.

SS, VSS and TOC removal efficiencies in R1 and R2 reactors were determined as 63%, 72%, 53% and 63%, 73%, 57% at the end of 60 days of sludge stabilization, respectively. DOC concentration in R1 reactor was increased from 8.5 mg/l to 31 mg/l whereas the DOC concentration in R2 reactor was increased from 14 mg/l to 20 mg/l. These findings indicated that primary settling did not affect the performance of aerobic sludge stabilization. According to the respirometric results, high oxygen uptake rate (OUR) was observed in R2 reactor compared to R1 reactor at the beginning of stabilization. However, similar OURs were obtained for both reactors after 28 days of stabilization.

Keywords: Activated sludge, aerobic stabilization, respirometry

Figure 1. a) VSS concentration profiles during aerobic stabilization b) OUR profiles at the beginning and 28 days of aerobic stabilization period.

a) VSS concentration profiles during aerobic stabilization
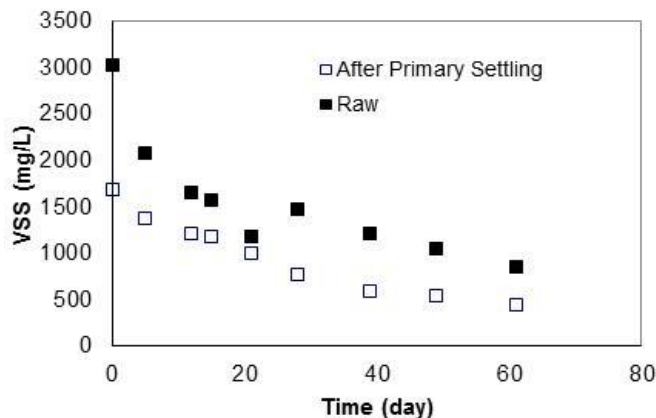
b) OUR profiles at the beginning and 28 days of aerobic stabilization period.
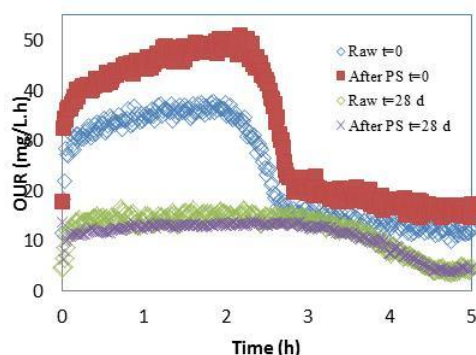
Evaluation of Enzyme Addition in Aerobic Stabilization of Biological Sludge

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In this study, aerobic stabilization studies were conducted for 27 days on biological wastewater treatment plant sludge samples, which were collected from 4 Wastewater Treatment Plants (WWTPs) located in 3 different regions in Turkey. Samples were spiked with an enzyme to observe its effect on aerobic stabilization of sludge. For each sample, one reactor without any addition served as the control reactor. The Total Chemical Oxygen Demand (TCOD) removal ranged between 50 and 78% in control reactors and between 63 and 80% in enzyme-added reactors indicating a positive effect of enzyme addition on COD removal. Similarly, Volatile Suspended Solid (VSS) removal efficiencies in enzyme-added reactors were 2-11% higher than in control reactors, except in WWTP 1. Therefore, enzyme addition prior to aerobic stabilization may increase the effectiveness of aerobic stabilization, but the cost of this process has to be further evaluated.

Keywords: aerobic stabilization, domestic, enzyme, municipal, treatment sludge

Fenton and Ozone Disintegration of Excess Sludge

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In the present study, the effectiveness of ozonation and Fenton oxidation for sludge disintegration is experimentally examined on excess wastewater sludge samples obtained from three municipal and three domestic wastewater treatment plants in Turkey. To determine the parameters governing the disintegration performance of ozonation and Fenton oxidation, the increase in the soluble COD concentration compared with the control sample was evaluated since oxidation through ozonation or Fenton process leads to the destruction of the cell walls of the microorganisms in the biomass and elution of cytoplasm into the bulk solution resulting in an increase in the soluble COD. For the Fenton process, experiments were conducted at pH 3.0 ± 0.2 and at varying hydrogen peroxide (H_2O_2)/total solids (TS) ratios (50-70 mg H_2O_2/g TS) and Fe^{2+} ion/H_2O_2 ratios (50-90 mg Fe^{2+}/g H_2O_2). The dissolved COD concentrations of the Fenton treated sludge were increased at the studied experimental conditions. As an example, for sludge sample having initial TS and dissolved COD concentrations of 10550 mg/L and 91 mg/L, respectively, the dissolved COD concentration was increased to 550 mg/L at the end of 60 min treatment (experimental conditions: 50 mg H_2O_2/g TS and 50 mg Fe^{2+}/g H_2O_2). The increase in initial H_2O_2 concentration enhanced the sludge disintegration rate up to an optimum value however further increase in initial H_2O_2 concentration resulted in a decrease in solubilization performance due to HO• scavenging effect of H_2O_2. The optimum initial H_2O_2 concentrations were different from each other for the sludge samples investigated.

The ozonation experiments were conducted in an 1.5 L ozonation tank with ozone dosages ranging from 0 to 0.2 mg O_3/mg TS. Excess sludge samples of 0.6 L volume were used in the experimental studies. The effect of ozonation on the solubilization of the organic matter can be observed even at the minimum applied dose of 0.05 mg O_3/mg TS with the increase in the soluble COD compared to control reactor ranging between 11 and 532%. For all sludge samples, increase in the applied ozone dose resulted in higher solubilization of the organic matter up to 0.2 mg O_3/mg TS. Ozone doses higher than 0.2 mg O_3/mg TS resulted in bulking of the sludge in the upflow ozonation reactor and hence, the optimum dose is determined as 0.2 mg O_3/mg TS. At this dose, the minimum, maximum and the median increase in the soluble COD were 80, 3290 and 550%, respectively, suggesting the importance of the sludge characteristics.

The results of the present study demonstrated that both ozonation and Fenton processes can be used for the disintegration of excess sludge after conducting of experimental studies for the optimization of oxidation parameters.

Keywords: disintegration, excess sludge, Fenton, ozone, solubilization

Recycling of steel-industry waste byproducts into extruded clay bricks

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In the present work, the feasibility of recycling steel-industry waste byproducts into extruded clay-based bricks, is examined, an undertaking of technological, economic and environmental interest. Actually, the management and valorization of massive quantities of solid residues recovered in steel production plants in Greece and worldwide, such as electric arc furnace dust (solid waste from gas treatment), electric arc furnace slag and ladle furnace slag, represent a significant issue. These by-products, however, contain several oxides, and thereby they could be considered as secondary raw materials for substituting traditional clayey materials in ceramics fabrication. The considerable amounts of fired clay bricks manufactured in the country also support this endeavour.

Main oxides in electric arc furnace dust were found to be FeO and ZnO (over 50 wt. % of the dust). Electric arc furnace slag mainly contains FeO, CaO and SiO_2 (their sum exceeds the 80 wt. % of the slag). CaO predominates in ladle furnace slag (over 50 wt. % of this slag), but especially SiO_2 and even FeO and Al_2O_3 are also identified.

For the utilization of the recycled by-products, a laboratory pilot-plant simulation of the industrial processes for brick fabrication by extrusion was employed. Greek clays were selected as the base materials and characterized. Then, various clay/byproduct mixtures were prepared and mixed with water to form a plastic mass for extrusion of specimens. The mixture plasticity (workability), extrusion procedure and drying behavior of specimens were optimized in order to obtain integral specimens possessing sufficient green density and strength for the subsequent stage of firing at typical temperatures up to 850, 950 and 1050 oC, which was conducted in a controlled furnace. The effect of the % byproduct content, and also of the firing temperature, on the bulk density, water absorptivity, open porosity, thermal conductivity and mechanical strength of the fired specimens was determined.

According to the results, the addition of EAFD up to 15 %w/w into clayey mixtures is tolerable for the effective extrusion of bricks, without significant variations in both the mechanical performance and the thermal conductivity of the fired materials. Sintering EAFD-loaded clays either at 850 oC or 950 oC leads in brick production with similar both mechanical and thermal behavior. At 1050 oC, the thermal conductivity increases as a result of a decrease in open porosity, while also the % water absorption ecreases, which could be of importance in terms of frost-resistance behavior.

Keywords: Recycling, steel-industry by-products, clay bricks, extrusion, sintering, physico-mechanical properties

Evaluation of Ultrasonication and Microwave Disintegration of Waste Activated Sludge

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The study was aimed to evaluate the effect of ultrasonic and microwave disintegration on the solubilisation of municipal sludge. In this context ultrasonic and microwave disintegration were applied to waste activated sludge (WAS) samples obtained from 6 different wastewater treatment plants located in Turkey. The effects of microwave temperature and duration in a range of 100-190°C and 10 to 20 min, respectively and ultrasonic specific energy of 5000 to 50000 kJ/kg TS were investigated for different sludge samples with variable total solids concentration. The ultrasonic disintegration was performed with an ultrasonic homogenizer (Bandelin Sonopuls HD 2200, Germany) equipped with a VS 70T probe, an operationg frequency of 20 kHz and a power input of 200 W. The amplitude of 100% was applied for a 200 mL of WAS samples which resulted in a sonication density of 1 W/mL. Microwave unit (Milestone ETHOS One SK-10) equipped with fiber optic temperature and pressure control, was used. The solubilisation of waste activated sludge due to ultrasonic and microwave disintegration was assessed in terms soluble chemical oxygen demand (SCOD) and the extent of sludge disruption was determined by the calculation of disintegration degree. Figure 1 illustrates the release of SCOD (a) and the disintegration degree (b) at different ultrasonic specific energy inputs. The results show that an increase in the specific energy increased the COD solubilisation but the sludge type had a significant effect on the sludge disruption. The effect of microwave disintegration on the release of SCOD was given in Table 1. Microwave disintegration proved to be the most effective pretreatment for WAS samples increasing the disintegration degree up to 80%.

Keywords: waste activated sludge, ultrasonication, microwave, disintegration
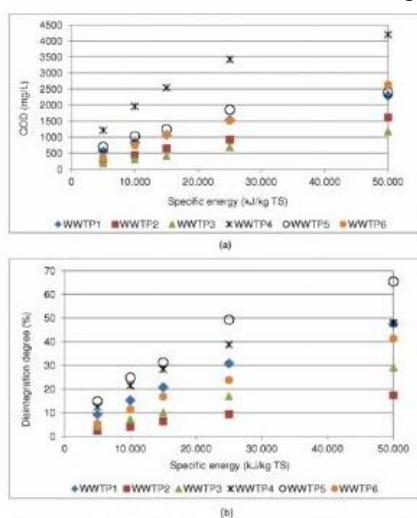
Figure 1. Effect of specific energy inputs on SCOD increase (a) and disintegration degree at different specific energy inputs (b)

Table 1. Effect of microwave disintegration on SCOD increase at different microwave temperature and duration

MW temperature and duration	WWTP1	WWTP2	WWTP3	WWTP4	WWTP5	WWTP6
	Soluble COD (mg/L)					
----	140	91	24	156	198	21
100°C 10'	986	1615	658	1052	958	827
100°C 20'	1150	1920	690	1972	914	885
150°C 10'	1860	4300	1142	3500	1610	2150
150°C 20'	1914	4467	1150	3400	1712	1750
175°C 10'	3225	4828	1506	5010	2783	2773
175°C 20'	3210	5074	1890	5260	2783	3290
190°C 10'	2640	4900	2183	5180	2889	2897
190°C 20'	3580	6574	2564	5340	3130	3990

Thermophilic anaerobic digestion of livestock manure & animal fat in highly loaded digesters

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The increased demand for food of animal origin in the industrialized world has led to the development of agro-industries. It is well documented that production animals during their lifespan are constantly generating wastes, including but not limited to manures and slaughterhouse wastes. It has been estimated that a dairy cow during its life time will generate approximately 60 tons of manures while during slaughtering only 65% of its live weight will be converted into marketable products. Despite the large volume of animal manures generated from different agro-industries, every year significant quantities of wastes rich in fat are also generated from food processing plants and slaughterhouses. These fat rich wastes are considered one of the most difficult to treat wastes streams and are usually separated before treatment and dumped into landfill sites or burned in incinerators.

One way to treat animal manures and fat rich wastes is through anaerobic digestion (AD). AD is a well established waste-wastewater treatment method applied around the world for the valorization of manures with mixed results. The main problem with these systems is the low biogas yields. Primary reason for this is the low biodegradable organic matter available in manures with the biogas yields fluctuating between 10 & 30m3/m3 of incoming wastes. In order to improve yields it is required other wastes to be used as co-substrates. A substrate that considered being of particularly interest is the fat of animal origin as its biomethane potential is calculated at 1000 m3/ton. While fat is indeed an attractive substrate for anaerobic digestion systems its treatment in monodigestion systems is not possible mainly due to the long chain fatty acids presence in the wastes that led to the inhibition of the process.

The purpose of this study was to examine the animal fat as a substrate in thermophilic AD systems and especially to identify the optimal conditions in order to decrease the high organic loading of the substrate and produce energy in the form of biogas.

The experiments were divided into 2 stages. In the first stage bio-methane potential experiments took place in batches with animal fat as single substrate and in initial organic loading rates ranging between 4,80 and 45,01KgVS/m3, as well as co-digestion experiments in batches of animal fat and dairy cow manure in which the initial organic loading rates ranged between 62,15 and 69,72KgVS/m3. The methane potential of the fat as single substrate found to fluctuate between 588 and 621 m3 CH4/ton fat, while for the co-digestion of fat with the manures the methane potential found to fluctuate between 23,3 and 35,7m3CH4/m3 waste. Subsequently, experiments were conducted in 4 continuously stirred tank reactors of 50L total volume. The maximum methane yield achieved was 336mlCH4/gVSadded, (i.e. 32,5m3CH4/m3 wastes) which indicates an improvement of 142% compared to the monodigestion of cattle manures. This research demonstrates that animal fat can be utilized as a co-substrate to thermophilic AD systems operating with organic loading rates of at least 5,02KgVS/m3-d and subsequently improve the economics of the systems.

Keywords: Anaerobic digestion, animal fat, manures

Anaerobic digestion of food wastes and dairy cattle manure under thermophilic conditions: focusing on organic loading rate

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According to the Food and Agriculture Organization of the United Nations, 30-50% of food produced in the world annually ends up as a waste and nearly entirely dumped in landfill sites. Diverting this waste stream from landfills will contribute significantly to the targets set by the EU Directive on landfilling (1999/31/EC) reducing in the same way the adverse effects of their degradation into the environment. The highly heterogeneity of these wastes, as well as their physicochemical characteristics including high organic and nitrogen content, low PH and their high biodegradability, render them as a hard to tackle waste stream. Dairy cattle manure is probably the most abundant agro-industrial waste requiring management according to the Nitrate Directive, as well as in order to protect human communities from microorganism pollution of ground and underground potable water sources.

The anaerobic digestion (AD) process is an attractive waste-wastewater management method presenting economic, social and environmental merits. The AD utilizes a consortium of different microorganisms that are able to convert the organic matter into biogas and liquid digestate. The produced biogas can be utilized as a renewable energy source while the produced digestate can be used as high quality organic fertilizer for agronomic operations. When it is required digestion of different waste streams can take place together, something known as Co-digestion which could led to improved biogas yields from a given size system as an effect of balancing the physicochemical characteristics of the incoming waste streams. The purpose of this study was to examine the food wastes and dairy cattle manures as candidate substrates for highly loaded wet thermophilic AD systems, as well as to distinguish the maximum organic loading rate and the most productive mixtures based on volumetric and specific methane production. In the first experimental stage, biomethane potential studies took place for 12 different food residues selected from the different groups of food wastes and in initial organic loading rates ranging between 10 and 60 kg VS/m3. Biogas production for the different waste types found to vary between 233 and 605 m3/t. More specifically, fruits and vegetables offer the least quantities (233 m3/t), for the starch rich wastes the production found to vary between 180-358 m3/t, while protein rich wastes provided the highest quantities of biogas (605 m3/t).

Subsequently, a mixture of food wastes was prepared which co-digested with cattle manure in 4 continuously stirred tank reactors (CSTR) of 50 liters. During the experiment with the mixtures of food wastes and cattle manure the maximum yield reached 399 mlCH4/gVSadded with a removal efficiency of volatile solids sustained to 77%. The volumetric methane production reached 46,5m3CH4/m3-d (i.e.1.33 lCH4/lR-d) with a specific methane production increase of 221% when compared to monodigestion of dairy cattle manures. The present research demonstrates that anaerobic co-digestion of mixtures of food wastes and dairy cattle manure could be successful with organic loading rates of at least 6,8 kgVS/m3-d with total solids content of the incoming mixture fed to the CSTR systems reaching as high as 16%.

Keywords: Anaerobic digestion, food wastes, cattle manure

Kinetics and thermodynamics studies of cobalt ions adsorption onto zeolite A from aqueous solutions

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The removal of cobalt from aqueous solutions by zeolite A was investigated. The characteristics of zeolite were determined by XRD, SEM, EDS, FTIR, DTA and TG techniques. The effects of solution pH, initial cobalt concentration C, solid/liquid ratio R and temperature T were studied in batch experiments. The Freundlich and the Langmuir models have been applied and the adsorption kinetics followed both adsorption isotherms. A comparison of kinetic models applied to the adsorption of cobalt ions on the zeolite was evaluated for the pseudo first-order and the pseudo second-order kinetic models. It seems that these models were found to correlate the experimental data. Intra particle diffusion model was also used. The thermodynamic parameters namely the enthalpy $\Delta H°$, entropy $\Delta S°$ and free energy $\Delta G°$ of adsorption of $Co2+$ ions on A zeolite were determined.

Keywords: Adsorption, cobalt, zeolite A, kinetic study, thermodynamic study,

Citric acid as an alternative lixiviant for zinc recovery from ZnO/Al$_2$O$_3$ catalyst

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Metals play an important part in industrial development and improved living standards. Society can draw on metal resources from Earth's crust as well as from metal discarded after use. New routes for metals recycling are continually investigated not only for lowering costs but also to prevent the environmental pollution. Zinc is among the most prevalent and valuable metals used in industry. At present, approximately 70% of the zinc produced originates from mined ores and 30% from recycled or secondary source. The widely used method to treat and recycle zinc involves hydrometallurgical unit operations in which mineral acids such as HCl, H2SO4 and HNO3 are commonly used as leaching reagents. However, mineral acids cause environmental pollution. Citric acid is a naturally occurring fruit acid, produced by microbial fermentation. It is considered as non-persistent biodegradable organic product since its half life in soil suspension is close to 8 days. This study investigates the recovery of zinc from ZnO/α-Al2O3 catalyst by citric acid solutions. The effects of acid concentration, stirring speed, temperature and the presence of anions were investigated. The results have shown that citric acid at low concentration (0.05 mol/L) dissolved 90.4 % of ZnO after 1 h of reaction at 50 °C. The dissolution was affected by the electrolytic composition. In fact, the dissolution efficiency was found to increase in the presence of chlorides and nitrates while slight effect was observed when sulfates were present with citric acid.

Keywords: Zinc oxide, Acid leaching, Citric acid, Anions, Reaction Kinetics.

Influence of compost produced from sewage sludge on barley biomass and soil properties

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In a pot experiment barley was grown in two soils amended with various rates of composts produced from municipal sewage sludge of a waste water treatment plant and different bulking agents. The experimental design was complete randomized blocks with five treatments each replicated three times. The treatments were Control (C), soil without compost; CA1, soil amended with compost A (bulking agent wheat straw) in proportion 1%; CA2, soil amended with compost A in proportion 2%; CB1, soil amended with compost B (bulking agent pruning of ornamental plants) in proportion 1%; and CB2, soil amended with compost B in proportion 2%. Five kg air dried of the two soils studied (one Typic Xerochret and the other Typic Haploxeralf) were thoroughly mixed with the compost in amounts corresponding to the previously referred rates and transferred in plastic pots, irrigated with water up to field capacity left for five days and were shown with 20 seeds barley (Hordeum vulgare) and transferred in a non heated greenhouse. After one month the plants were thinned to ten per pot. Three months after seeding the plants were harvested, separated in roots and above ground parts and after the proper preparation were analyzed for the nutrient content and potentially toxic elements. At the same time soil samples were selected, and analyzed for the same elements as in the plants. The results were statistically treated (analysis of variance and regression analysis).

The results showed that compost A at the rate 2% and compost B at both rates (1 and 2%) increased significantly barley biomass compared to control at various percentages from 65 up to 123%. The increase was attributed to the increased uptake of N, P, K and B. From the soil properties tested, pH and exchangeable K were increased in soil Typic Haploxeralf, and electrical conductivity, organic carbon, total nitrogen, and POlsen in both soils. Available B was not affected. No significant differences were recorded in the potentially toxic elements studied (Cd, Pb, Cr, Ni) neither in Zn and Cu. The final conclusion of this study was that compost produced from sewage sludge and wheat straw and plant residues from ornamental plants may effectively be used for growing barley crop.

Keywords: sewage sludge, compost, soil quality

The use of steel slag as a liming agent for acid soils

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An amendment is any material added to a soil to provide a better environment for plants. Liming an acid soil to an optimal range is the initial step in creating the favorable soil conditions for productive plant growth. On the other hand, massive quantities of industrial byproducts are produced in the world and the actual problem of the governments and the industries is to recycle and dispose of them in an environmentally being way. The steel slag can be an effective liming material in the favorable soil conditions; it can be used as amendment for acid soils considering the high contents of Ca and Mg.

This paper presents the data obtained in the first stage of a national research project regarding the use of steel slag resulted from a romanian steel refinery as a liming agent for acid soils. The research studies were initiated starting with the selection of the acid soil situated close to Bucharest, Romania and it was evaluated the possibility of field applications using steel slag named in our project LF slag. The physical and chemical characteristics of the acid soil are presented. The soil belongs of the silt loam medium texture class according to Soil Taxonomy Romanian System (STRS). The preluvosoil has an acidification tendency taking into account the actual pH value (5.62) compared to the normal pH value of a preluvosoil (6.0-6.4). Also, the soil is in an early debasification process, the Base-Cation Saturation Ratio (BCSR, named V in our paper, expressed as % from CEC) value is 75%, bellow the normal values which are 80-85%. Some chemical characteristics of the steel slag LF are also presented. The steel slag LF can be used as soil acid amendment considering the high contents of CaO and MgO and low Al_2O_3. The hydrolysis of CaO and MgO in water and the presence of acid H^+ ions produce divalent ions (Ca^{2+} and Mg^{2+}); they will contribute at the Cation Exchange Capacity (CEC) in the soil. Steel slag contains certain metals as: Cr, Zn, Ni, Pb, Sn, Sb, Mn, Ti, etc. It is alkaline.

For environmental reason, the behavior of the slag in the soil has to be tested. The effects of the steel slag LF applied at different rates on some characteristics of acid soil have been investigated in the laboratory and green house experiments.

Keywords: steel slag, amendment, acid soil

Biochar from olives wastes as efficient agent for polluted water remediation

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Actually, management of solid wastes from olive crop increases about their potential reuses as material for the amendment of soil or as polluted water remediator. This work reports preparation of biochar from olive solid waste and tests of adsorption of some potential pollutants.

The preparation of biochar was achieved in two steps. At first, pyrolysis was conducted under inert atmosphere at 800°C in order to increase the porosity and the surface activity of the final product. The second step dealt with the chemical activation that was conducted at 100°C using chlorhydric acid (36%). Preliminary adsorption tests were performed with mehylene blue. After, tests of adsorption were performed in batch solutions loaded with selected metallic ions or organic pollutants. Parameters of adsorption are deduced from conventional models (Freundlich and Langmuir). Comparison with activated carbon are reported

Keywords: olive wastes; adsorption, activation, remediation, pollutants

Waste management and Industrial Ecology

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A sustainable use of resources and waste management are among the key levers indicated by the European Community (EC) to preserve the earth's resilience in order to achieve a decoupling between economical growth and environmental burdens through an improvement in process and product efficiency, dematerialization practices and measures for prevention in waste generation. Prevention in also at top of the European waste hierarchy proposed by the Directive 2008/98/EC with the goal to indicate the order of preference to be followed for a virtuous waste management; although such a hierarchy be a general approach that need to be evaluated case by case, the main driving idea lays in the achievement of an integrated waste management system in which every flow and treatment process constitute the basis for a society consistently based on the pillar of "waste as resource".

Despite EC guidelines, a delay in adopting an integrated waste management system by most of the Member States still occurs, and landfill disposal remains the most common waste management option, averagely for more than half of total municipal solid waste produced in Europe. Among others, reasons of such a delay in the path towards sustainability must be sought in obstacles when (i) creating markets for secondary products, (ii) adopting criteria for minimum rates of recycled materials in production, (iii) extending lifetimes of products and producers' responsibility, or (iv) standardizing measures in Europe which would guarantee the respect of proximity in the waste management. Moreover, the EC claims countries to adopt tools and indicators to quantify and assess environmental performances of systems and programmes.

In this sense, Industrial Ecology (IE) methods and practices support the seek for a development consistently based on circular flows of material and energy as much as on environment and human health protection. Specifically, a systemic approach to environmental issues is guarantee by applying methodologies as Life Cycle Assessment (LCA), Material Flow Analysis (MFA), Industrial Symbiosis (IS) and Design for Environment (DfE) practices, and policy approaches (e.g. Integrate Product Policy, IPP). Indeed, such methodologies answer the necessity to face emergencies related with waste management reflecting criticalities from recovering materials embedded in waste flows and agglomerates, and they inspired part of the contemporary research to consider human conglomerates as "mines of the future" (urban mining).

The awareness of environmental emergencies, technical and scientific progress together with the sense of responsibility towards the next generations do not allow to ignore or postpone over the need to answer the claim for more sustainability. IE tools allow an overall systemic approach for supporting theoretically and practically the concept of waste as resource.

Keywords: Integrated Waste Management, LCA, MFA, Industrial Symbiosis, Sustainability, Urban Mining

Effects of Biosolid on Plant Available Metals and pH in Kiwi Fruit Application

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The general objective of this work was to study biosolid application to kiwi fruit growing in an alkaline soil. The work was carried out over a 1-year period with the aim to understanding relationships between biosolid application and soil heavy metal concentration (total heavy metal concentration) and heavy metal availability (DTPA extractable heavy metal concentration) under field conditions. Biosolid was applied a 10y old kiwifruit (Actinidia deliciosa) garden located in Akova (Sakarya-Turkey). The biosolid used in the experiments was obtained from the Municipal Wastewater Treatment Plant, Sakarya. The experiment was conducted in randomized block design (RBD), having four different application rates of biosolid equivalents to 25 t/ha, 50 t/ha, 100 t/ha and 200 t/ha. Control treatment was not amended. Three replicates were performed for each treatment.

Physicochemical properties of the biosolid were; pH 7.4, EC 1998 µS cm-1, organic matter content 54%, total N 4.10%, P 3.15%, K 0.12%, CEC 8.53 cmol (+) kg-1, organic carbon 31.21%, C/N 7.61. Heavy metal content of biosolid was obtained as 19 mg kg-1 Cu, 1435 mg kg-1 Zn, 243 mg kg-1 Cr, 79 mg kg-1 Ni, 34 mg kg-1 Pb, and 3 mg kg-1 Cd. Chemical and physicochemical properties of the soil were obtained as texture saturation of 72%, pH 8.7, EC 488 µS cm-1, organic matter content 2.81%, total N 0.141%, P 17.14 ppm, K 632 ppm, CaCO3 10.1%. Elemental composition of the soil was obtained as 2.9 mg kg-1 Cu, 1.14 mg kg-1 Zn, 6970 mg kg-1 Ca, 741 mg kg-1 Mg, 5.9 mg kg-1 Fe, and 3.88 mg kg-1 Mn. The total concentrations of heavy metals in the biosolid were obtained much lower than the limits recommended by the Turkish Soil Pollution and Control Regulations for agricultural usage and current limits established by the EU or by the USEPA for biosolids applied to agricultural soils. Biosolid application was decreased the soil pH (7.8) especially at the 200 t/ha rate over 1-month observation period. 23 elements were analyzed in the soil extracts for each total and DTPA extractable metals. From the obtained results, biosolid application has no effect on soil K, Ca, Mg and Cu total heavy metal concentrations. Furthermore an increase was determined for Fe, Zn and Mn concentrations. The highest total metal concentrations obtained as, 1370.54 mg/kg DW Fe, 5.7223 mg/kg DW Zn, 55.1832 mg/kg DW Mn for 200 ton application. From the obtained DTPA extractable metal concentrations, results showed that biosolid application has impressive effect on transition of Cu, K and Na concentrations especially for the 50 ton application rate. At the 50 ton practice rate, soil total Cu, K and Na concentrations were convert to plant available forms in order of 5%, 10% and 20%. Obtained results indicate that relatively low application rates of biosolid could be used to maintain crop production. Also the evaluation of the impact of multiyear biosolid applications on kiwi fruit production would be extremely helpful before making recommendations for long-term biosolid application or disposal.

Keywords: Biosolid, total heavy metal, plant available metal, pH, kiwi fruit

Concept of Reclamation Management for the Heavy-Duty Waste Engine Oils

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Off-highway heavy-duty equipments such as haul trucks, electric and hydraulic shovels, drills, loaders and dozers are widely used in traditional coal mining and processing industry for energy intensive operations particularly including excavation, preparation, separation and material transfer. During operations, poor mining and adverse weather conditions all contribute to the stress of equipments; thus, non-road diesel engines are subjected to high mechanical and thermal loads for long periods. These severe conditions have a great influence on the actual life of the engine lubricants and lead to rapid deterioration of the lubricants that are directly contacted with the engine block. Lack of improper lubrication generally causes overheating and excessive wear in the bearing and can account approximately 80% of bearing failures. For these vehicles, engine oils should be replaced frequently; in other words, old lubricants must be drained exchanged with the fresh one. The old engine oils are defined as waste engine oils which are classified as hazardous substance because of their chemical compositions stated by Ministry of Environment and Civilization as the regulating authority. "Regulation on the Control of Waste Oils" distinguishes the three main reclaiming methods on the basis of waste oil categories. These categories are arranged in a hierarchial structure according to the levels of heavy metals (arsenic, cadmium, chromium, lead), PCBs, total halogens and chlorine. The categories of waste engine oils must be determined before the implementation of reclaiming management procedures. These procedures are divided into three parts; refining/processing applications to produce more valuable and in-demand products, recovering as supplementary fuel in cement or lime production plants and disposing at hazardous waste disposal facilities. In this study, waste engine oils are collected from different heavy earthmoving equipments operated at coal mining facilities and the categories of these waste oils are determined within the framework of "Regulation on the Control of Waste Oils (implemented since January 2004)" in order to prevent the environmental pollution and improve the hazardous waste management system in coal mining sites. It's seen that, the waste oils generated from heavy-duty equipments of coal mining sites can be either used in refining applications due to their high hyrocarbon content or in recovering applications as supplementary fuel in cement or lime production plants because of their high calorific values.

Keywords: Waste engine oils, reclamation of waste oils, hazardous wastes, coal mining sites.

Effects of municipal solid waste compost on net nitrogen mineralization and potential nitrification rates in clayey and sandy soils.

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Nitrogen mineralization and nitrification are indicators of microbial activity and soil fertility. The aim of this study was to evaluate the effects of the municipal solid waste compost addition (at rates equivalent to 0, 60 and 150t ha-1) on net nitrogen mineralization and potential nitrification rates in two different textured soils (sandy and clayey soil) which were cultivated with Cichorium spinosum (stamnagathi). Five soil samplings were carried out during the whole growing period of stamnagathi. The determination of net nitrogen mineralization rate was performed by incubation of the soil samples for 28 days. The potential nitrification rate was determined by incubation of the soil samples for 3 days, after $(NH_4)_2SO_4$ addition. The inorganic forms of nitrogen were measured with KCl extraction.

In the clayey soil, net mineralization rates were found negative, indicating nitrogen immobilization, maybe due to the high content of clay which created anaerobic conditions. In contrast, in the sandy soil, net mineralization rates were positive and were increased in the soil samples with higher content of municipal solid waste compost. Potential nitrification rates were found higher in the clayey soil. The addition of municipal solid waste compost increased the potential nitrification rates, in both soils.

Keywords: Nitrogen, N-mineralization, nitrification, soil, stamnagathi

Life Cycle Assessment of Waste Tire Pyrolysis

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In Turkey, annually about 8 million tires are produced and an estimated 284,800 tons/year of tire waste must be disposed. Recovering of waste tires as granulated material is not a sufficient method for an effective treatment. Other treatment alternatives are based on thermal technologies. Pyrolysis is becoming one of the best thermal alternatives for waste tires. But, there is no legislation that controls the environmental effects of pyrolysis plants. For that reason pyrolysis plants are considered under the legislation on incineration. On the other hand, a lot of new pyrolysis plants set up in Turkey.

In this aspect, a Life Cycle Assessment is carried out to determine the environmental impacts of the waste tire pyrolysis to give a scientific support to commercial practitioners and decision makers. The functional unit of the assessment was 1 ton of waste tire used as raw material. The system boundary including feedstock pretreatment and pyrolysis was illustrated and material/energy flows including raw material, pyrolysis products etc. were determined according to commercial pyrolysis plant and literature data. The process was modeled in Simapro 7.3.3. Environmental effects were calculated by using CML 2 baseline 2000 method for seven impact categories were evaluated: abiotic depletion, global warming potential, ozone layer depletion, human toxicity, photochemical oxidant formation, acidification and eutrophication. Therefore, this study would provide a framework to better understand the major environmental effects of waste tire pyrolysis and conversion to useful products.

Keywords: Life Cycle Assessment, waste tires, pyrolysis, SimaPro7.3.3

Life Cycle Thinking of Biowaste Management

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Biowaste is a type of waste which can be broken down, in a reasonable amount of time, into its base compounds by micro-organisms and other living things, regardless of what those compounds may be. Biodegradable waste can be commonly found in municipal solid waste, green waste, food waste, paper waste, and biodegradable plastics. Other biodegradable wastes include human waste, manure, sewage, and slaughterhouse waste.

The composition of biowaste from households generally varies between countries/regions according to a range of factors, including geographical location, season, the urban or rural character of the area, type of settlement, standard of living, culture and food & drink habits, etc. The design of collection schemes and the level of promotion of home composting will also have an influence on the composition. There are several main biowaste collection systems; separate collection, mixed collection and integral collection. These methods vary from countries, climate zones, types and quantities of biowaste and even political decisions. Also, it is same with biowaste treatment policies. Regardless of which systems, landfill, composting, incineration, anaerobic digestion or gasification, are used it comes down to economical and political interests.

There are preliminary concepts for possible guidelines for biowaste management. Landfill, composting, incineration or other methods are considered as a possible solution whether combining them together or as a single solution.

In this study, biowaste management options in Turkey are evaluated with life cycle thinking and possible solutions are discussed.

Keywords: Biowaste management, life cycle thinking, biodegradable waste, municipal solid waste, biowaste collection systems

Environmental Pollution Management in SEE Ports and Costal Areas

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Tenecoport aims to capitalize the Ecoport 8 results, on waste management by including different actors with different roles for compiling the eco management tasks. First step of Tenecoport project is that the methodology used during Ecoport 8 project to identify and evaluate all environmental issues relating with the pollution and nuisances in ports and coastal area, should be implemented in other new ports involved in this project.

Organizing the round tables, in each ports, with all stakeholders for each environmental issue i.e port authorities, polluters, local institution and decision makers, enterprises, external operators, citizens of the involved countries and operators working on EMS will help in finding the adequate and proper solution to solve every environmental issue such as: aquatorium water quality; solid waste generated by ships, port areas and coastal zones management; air pollution; noise; port development etc.

Port's Eco maps will show the most critical environmental issues and their location by symbols visually, including data bases of values of pollution indicators.

After preparing the eco maps, the information will be presented in the WEBGIS platform, increasing in this way the visibility and the access to project result. Furthermore environmental pollution management consist in establishing a common model of environmental and sustainability development and sustainable accessibility of the sea-networks.

The Common model platform will stimulate an integrated policy on environmental protection and growth of TEN corridors and will be a guide in environemntal pollution management of ather mediteranean ports. Enhancing the cross-border and trans-European partnership between SEE port areas developing collaboration and effective relation among all stakeholders are some of the main results of this project.

Developing and implementing intelligent environmental port management and information systems using integrated technologies for environmental risk protection will reduce impacts on human health, biodiversity and environment.

Keywords: Ports, Environmental Management Systems (EMS), TEN ECOPORT, WEBGIS platform, Ecomaps.

Conditioning of waste activated sludge for dewaterability by ultrasonic radiation

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Efficacy of sonication was tested at batch cycles for sludge dewaterability on waste activated sludge samples. The study was specifically focused on the effect of specific energy and the changes in characteristics of the sludge were mainly followed by Capillary Suction Time (CST) and Specific Resistance to Filtration (SRF) parameters. The changes in viscosity, pH, TDS and VS parameters were also elaborated to better understand the effective mechanism of sonication. It was inferred from the study that sonication meets the expectations on sludge conditioning only if it is applied at low specific energy levels just only to destabilize the flocs but not to lyse the cells structure. CST periods of the slurries decreased from order of minutes to seconds by lowering the specific energy. The lowest CST, which was observed with the waste activated sludge, was 10 s at 0.02 kJ/L specific energy sonicated for 2 seconds. Sonicated waste activated sludge proved to be favorable to dewaterability. It was inferred from the study that the components of a specific energy, power and sonication period, should be applied such that power should be minimized and the period be maximized, to enhance the dewaterability of slurries.

Keywords: CST, conditioning, dewaterability, sludge, sonication

Evaluation of the impacts of public participation on municipal waste management

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In Antalya City, the household wastes are collected commingled and transported to the landfill by the municipality and buried. There are attempts to enhance separation at source: It is envisaged to collect the wastes produced in households in two separate bins as wet and dry.

The main goal of this study is to evaluate the possibilities of different source separation ratios according to their environmental performance with using Life Cycle Assessment (LCA) methodology. LCA is a powerful tool and assists the decision makers to evaluate the different management systems. It is intensively used as decision support tool in comparison of municipal solid waste treatment technologies; comparison of the LCA models developed for solid waste management systems, evaluation of solid waste management strategies and options and evaluating waste to energy systems.

In this study, waste characterization was done by using seasonal collected bin liners in containers located in different districts of Antalya. Different waste management scenarios were developed, depending on the proportion of waste obtained from studies conducted. Scenarios which were considered to allocate the source of public participation rates, developed on the basis of 1 kg of waste and the environmental effects were evaluated by SimaPro 7 Life Cycle Assessment program.

Keywords: Antalya, Waste Characterization, Life Cycle Assessment, SimaPro

Optimization of Municipal Solid Waste Collection System In An Aegean Touristy Area: Burhaniye

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Burhaniye is a district in Edremit Bay, at the Aegean Coast of Turkey. It has a steady population of 40,200 during the low winter season and about 380,000 in high summer season. Fluctuations in population throughout the year cause operational problems with collection and transport services of solid waste and tourism; the major economic activity in the region, suffers from the nuisance caused by inefficient collection of wastes. According to 2012 data, collection and transport expenses in Burhaniye have cost 49.3% of the total realized budget of Waste Management Operations Department. This study aims to optimize waste collection and transport system of the district so that; expenses for Waste Management Operations drops to 67% of its initial state.

First phase of the study was the generation of necessary input data for setting up a network dataset and scenarios compiling collected data into a spatial database. In the second phase of the study, residential intensities of waste generation were calculated for low, middle, high income and touristy areas. A detailed weighing campaign was carried out in order to calculate solid waste generation factors for each sub level. Amount of waste generation from each stratum is estimated using waste generation factors. Thirdly, the study area has been turned into a fully digitalized model where reception area of each container is determined, waste generators are assigned to reception points and truck routes/capacities are integrated in the system. Furthermore, an optimization analysis has been carried out by the use of Network Analyst. Whereas this study revealed that resources of waste collection/transport services were used inefficiently in the district, it promises about 20-40% decrease in overall truck running expenses and about 40% decrease in personnel expenses. The model, developed by the study will be used in order to update daily routes for each collection truck in the system, analyze different waste collection scenarios and to plan collection and transfer activities in case of extension of Municipality boundaries.

Keywords: GIS, Waste Management, Optimization of Waste Collection Routes, Network Analysis

Water pollution and control

EXCEED, EMPOWER Tunisia, and MESAEP Linking International Networks for Capacity Building and Research on Water Reuse

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Water is one of the 21st century's key development issues. The EXCEED and EMPOWER Tunisia projects at TU Braunschweig address to the MDG 7/C "Ensure Environmental Sustainability - Halve by 2015 the proportion of the population without sustainable access to safe drinking water and basic sanitation". These two projects are aiming at reaching this goal through international cooperation on education, capacity building, and joint research.

The Project EXCEED – Excellence Centre for Development Cooperation – Sustainable Water Management in Developing Countries began 2009 at TU Braunschweig together with 35 partner universities and research centres in developing and emerging countries, and is scheduled for 5 years granted through DAAD. Research and academic cooperation projects with partners from Latin America, Middle East, Sub-Sahara Africa, and South-East Asia have been developed focusing on sustainable solutions for each region's predominant water-related issues. The topics cover i.a. water in arid and semiarid regions, use of reclaimed wastewater for irrigation, and water quality and health.

A spin-off from EXCEED is the Project EMPOWER Tunisia – Emerging Pollutants in Water and Wastewater used for irrigation in Tunisian agriculture aiming at initiating a dialogue at scientific, educational, socio-cultural, and political levels on the most emerging topic in the Middle East "Water and its Scarcity". Water is essential for the development of the country in terms of food production, health, and prosperity, supporting thereby the transformation processes and political stability through meeting the demands of the population. EMPOWER Tunisia aims at building a network between universities, research centres, stakeholders, and policy makers to monitor the current situation of wastewater reuse in Tunisian agriculture and further Arab Countries. The objectives of EMPOWER Tunisia are (i) improving the state of knowledge on emerging pollutants in water, (ii) stocktaking of the current situation in water resources, (iii) developing sustainable solutions for the problems of irrigation water pollution, (iv) identifying the gaps of environmental knowledge and developing adopted solutions, (v) setting up a database for emerging pollutants in water for irrigation, and (vi) dissemination of the results through workshops and symposia. EMPOWER Tunisia was initiated by the later Chairlady, Dr. Olfa Mahjoub and the MESAEP Presidents, Prof. Pilidis and Prof. Topkaya in Ioannina, Greece September 2011 on the occasion of 16th MESAEP Symposium and started 2012. Several workshops under participation of scientists from Germany, France, Greece, Turkey, and all Arab Mediterranean Countries (MENA Region – from Morocco to Jordan) are organized in Tunisia, and students and researchers trained at TU Braunschweig. Sampling campaigns in Tunisia for irrigated soils, reclaimed wastewaters, and ground waters are conducted at irrigation sites and analyzed in Tunisia and in Braunschweig. The data from EXCEED Middle East Network and EMPOWER Tunisa on emerging pollutants shall be introduced along with those from other Arab Countries in an all Mediterranean Basin Database consisting of North Africa, Middle East, and Southern Europe for taking international environmental measures against emerging pollutants. A close cooperation of the two projects with MESAEP is highly appreciated. URLs: http://www.exceed.tu-braunschweig.de/ and https://empowertunisia.alumniportal.com/

Keywords: Sustainable water management, reuse of wastewater, emerging pollutants, global networking, Mediterranean Sea Basin

The Application of Decolarants in Removing Color and COD from Textile Dyehouse Wastewaters

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Many textile wastewater treatment plants in Turkey are currently experiencing problems in meeting the new established effluent discharge standard for the color parameter. Majority of textile wastewater treatment plants in Turkey employ conventional aerobic biological treatment processes. However, aerobic biological treatment is generally ineffective for color reduction mainly due to the presence of azo dyes and various types of dyes (reactive, disperse, etc.) used during production processes. Therefore, many treatment plants are investigating the application of different decolorants either prior to or after existing biological treatment operations. In this context, the main objective of this work was to test and evaluate the effectiveness of various types of decolorants, a flocculant and PAC (polyaluminium chloride) in removing color and chemical oxygen demand (COD) from textile wastewaters.

Wastewater samples were collected from two different sources: wastewater A, the influent of a full-scale treatment plant receiving wastewaters from 6 textile mills employing cotton producing and dyeing with mainly reactive dyes, and wastewater B, raw wastewater from a mill dyeing synthetic fabrics. Five types of cationic decolorants (named as A (dimethylamine-epichlorhydrin), B (polydiallyldimethyl ammonium chloride), C (polyamide), D, and E) were tested. In addition to these decolorants, a high molecular weight and cationic flocculant and PAC were also tested. The tested dosages of these decolorants, flocculant and PAC ranged between 50-1000 mg/L and 25-1000 mg/L for wastewater A and B, respectively. Jar tests were employed for raw wastewater samples and color (in Pt-Co and SAC units (spectral absorption coefficient at 436, 525 and 620 nm)) and COD were measured in supernatants after settling.

For wastewater A, the highest color removal (96%) was obtained with 420 mg/L dosage of polyamide-based decolorant. At the same dosage, COD removal was 95%. PAC dosage of 300 mg/L provided 97% COD removal in wastewater A. For wastewater A (from cotton production and dyeing), the tested three decolorants (A, B and C) and PAC with dosages of around 50 mg/L successfully reduced the color and COD values below the Turkish discharge standard limits (Color: 280 Pt-Co, COD: 250 mg/L). E and D decolorants also provided color and COD values below the limits at 100 and 200 mg/L dosages, respectively. For wastewater B (from synthetic fabrics), all the tested 5 decolorants and PAC with a dosage of 25 mg/L was sufficient to reduce the color and COD below the discharge limits (Color: 280 Pt-Co, COD: 400 mg/L). The highest COD removal (99%) was obtained using PAC with 300 mg/L dosage in wastewater B. It was found that the use of flocculant along with decolorants did not generally enhance color and COD removals. As a general trend, correlations were found between color and COD removals. The results overall indicated that the use of decolorants or PAC for various types of textile wastewaters seems to be effective in significantly reducing color and COD values even when applied to raw wastewaters prior to biological treatment. Application of decolorants after biological treatment may further reduce the required dosages to meet discharge limits.

Keywords: Color, decolorant, dye, textile, wastewater.

Liquid liquid extraction of the major phenolic compounds from olive mil waste water

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Reducing environmental impacts and getting economic benefits, based on by-product recovery, was the aim of applying the liquid liquid extraction for recovery of polyphenolic compounds from olive wastewaters, namely olive mill wastewater (OMW), the main pollutants of olive oil and table olive production industries the liquid liquid extraction were used. The effectiveness of the different operating conditions was evaluated using partiyion coefficient and rejection coefficients of: chemical oxygen demand (COD), color, total solids and total phenolic content (TPC). The effects of pH on the solution, solvent ratio and stirring and decantation extraction of tyrosol and hydroxytyrosol en further OMW depollution were evaluated. A substantial reduction of the aforementioned parameters was obtained. The obtained results show that the liquid liquid extraction using isoamylic or ethyl acetate and tributyl amine can be used as an efficient pretreatment for olive processing wastewaters at acidic pH. Extraction process of phenolic compounds from the centrifuged OMW is necessary and improve the effectiveness of any further secondary treatment. Therefore, The phenolic compounds were recovery with 95% at pH (1.5-2.8) and with a ration of solvent (2.5-3) and under (1h30 of stirring, 2h30 of decantation).

Keywords: Olive mill waste water, compounds phenolic, tyroslol, liquid liquid extraction

Estimation of Nutrient Loads from Point and Diffuse Sources in Ergene Basin and Its Potential Risk on Ecosystem

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Surface water sources, which natural and anthropogenic pollutants reaches in various ways, with rapidly increasing levels of pollution, has become one of the primary issues of sustainable life in the last thirty years. Nowadays, that limited waters sources in the world are consumed rapidly, while searching for solutions to problems, it has been seen that examining the factors affecting identified quality water sources and addressing water sources with its basin holistically are required.

The most important cellular components of organisms and with the limiting effect in water, nitrogen and phosphorus's effects to the ecosystem at surface water should be determined. For this assessment, estimating the amount of nutrient for the basin scale, and presenting the transportation and retention of nutrient load with the spatial and temporal variations should be placed.

In this study, on the basis of the sample of Ergene River, which takes part in the most polluted rivers in our country, it is aimed to determine the nutrient (total nitrogen and total phosphorus) loads from point and diffuse sources of the river basin and the effects of the nutrient loads. For this purpose,
• Using Geographic Information System, land use of the basin has been digitized and the spatial values of patterns of land use which is used to estimate the load from diffuse sources has been used.
• By using Exponential Function Method, population predictions have been made and the assumption of load change connected to population has been calculated.
• By using Export Coefficient Model, nutrient loads from diffuse sources have been estimated.
As a result of all data and estimations, the effects of the nutrient loads in Ergene Basin to ecosystem and socio-economic structure have been discussed.

In estimation of nutrient loads from point and diffuse sources of pollutants in Ergene Basin, for the loads TN (24000 tons/year) and TP (2700 tons/year) it has been seen that diffuse sources have a large share, such as 90%. Large portion of the nutrient loads from point sources (74% TN and 93% TP) are due to domestic wastewater, and when the distribution of the load from diffuse sources, chemical and natural (animal) fertilizers generates almost the total load (82% TN and 92% TP) has been out.

When the effects of nutrient loads at surface waters in Ergene Basin are considered both ecologically and socio-economically, it has been identified that intended use of water sources was changed, agricultural and aquatic production was negatively affected by deteriorated ecological balance at surface water. It has been determined that ecological sanctions at Basin should have the precedence over the socio-economic sanctions.

Keywords: Ergene River Basin, Export Coefficient Model, nutrient loads, point and diffuse sources, GIS.

The Prediction of Flow Rate and Nutrient Load with Artificial Neural Networks in Ergene River Basin

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Ergene River Basin with an 10733 km2 drainage area is located in Thrace region of Turkey. The mean annual flow rate is 28.73 m3/sec and the total length of Ergene River is 264 km. Approximately 70% of people in the region earn their living by agricultural activities. Industries, which came to the Thrace region from İstanbul since 1970's, concentrated on certain places that the ecosystem all over the region effected by these developments. In this study, with the thought that nutrient load of point and diffuse sources is dependent on meteorological conditions and flow rates, considering the example of Ergene River which is among the most contaminated rivers of the country and of which flood frequency is high, the following highest rate of monthly average flow and load change is aimed to be predicted. For this purpose, Luleburgaz Flow Observation Station (FOS) was chosen for modelling,because it is located in the point which physically takes place in the middle of the basin, to where domestic and industrial waste of the region with the population density of basin reaches, where seasonal flood is experienced. The relation among of hydrometeorological data of Luleburgaz FOS for 168 months, which belongs to the period from 1997 to 2010 is evaluated with Feed- Forward Back Propogation Neural Networks (FFBBNN) methods from Artificial Neural Networks methods and flow rate of Ergene River Luleburgaz Station has been predicted monthly for the year of 2011. The load change at the river has been observed with Direct Calculation Method by using the acquired flow rate values and long term feed concentration averages.

Keywords: Ergene River, Artificial Neural Networks, Direct Calculation Method, Nutrient loads

Cost Comparison of Conventional and Sustainable Urban Drainage Systems – A University Campus as a Case Study

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Unplanned development and expansion of urban areas results in increase of impervious areas that result in storm water related problems. Increased runoff coefficients together with decreased time of concentration during a storm increase the vulnerability of urban areas to floods. Another problem caused by impervious areas is the blocking of infiltration, which is an important process for groundwater recharge. Water quality of runoff is also adversely affected, since impervious areas block the interaction of pollutants with soil, where natural processes can degrade some of the pollutants (especially organic matter and nutrients). Increased flow rates on shorter runoff durations may in flash floods where the peaks of hydrographs and pollutographs have higher peaks. Infrastructures that have to deal with such urban runoff hydrographs and pollutographs have usually higher initial investment and operation/maintenance costs.

Implementation of sustainable urban drainage systems is an alternative strategy that can reduce the disadvantages of traditional urbanization and conventional storm water disposal systems. A sustainable urban drainage system (SUDS) is designed to reduce the potential impact of new and existing developments with respect to surface water drainage discharges. The idea behind SUDS is to try to replicate natural hydrological systems that use cost effective solutions with low environmental impact to drain polluted surface water run-off through collection, storage, and cleaning before allowing it to be released slowly back into the environment, such as into water courses. SUDS solutions should result in urban infrastructure systems that are easy to manage, require little or no energy subvention, resilient to use, and being environmentally as well as aesthetically attractive.

The scope of this study is to investigate the applicability of an integrated approach to storm water management systems where the main focus is to upgrade an existing storm water drainage system of a campus that has a drainage area of more than 90 hectares. For this purpose, two systems one conventional urban drainage system and one SUDS were designed and their costs were compared. Both systems were designed using the StormCAD software from Bentley Solutions. According to detailed cost analyses conducted in this study, we found out that the initial investment costs of SUDS were 34 % lower than the initial investment costs of the conventional urban drainage system. The details of the hydrological analysis, implementation of StormCAD for design and cost analysis will be given in the full manuscript.

Keywords: Sustainable Urban Drainage Systems, Conventional Urban Drainage System, Cost Analysis

Impact of Durres WWTP on pollution of Adriatic Sea

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As part of Mediterranean Region, Albania gives its own contribution on pollution of the sea by discharging the wastewater untreated. But in nowadays, the government has given high priority to wastewater treatment, particularly along the more densely populated coastal areas of the country, that are directly discharging into Adriatic and Ionian Sea. Furthermore, Albania has a national plan to implement sixteen (16) centralized WWTP that will serve to the most urbanized areas of the country (approximately 2.4 million inhabitants). Concretely, one of the WWTP that will reduce considerably the pollution that goes on Adriatic sea from Albania is Durres Wastewater Treatment Plant. It has been designed to serve to 250 000 p. e. until 2020. The technology is based on biological treatment with activated sludge. It consists of an advanced second level of treatment, with an anoxic zone followed by the aeration tank. As a third level of treatment will be used the reed beds. As for the sludge treatment line, it starts with dewatering tank and after that continues with anaerobic digester where the biogas will be produced. In addition, the produced biogas will be collected and will be used to generate electric power for the WWTP's needs. The last station of sludge will be in the sludge drying beds. This combination of technologies will reduce the amount of nitrogen and phosphorous in the discharged effluent which will meet the EU standards for wastewater treatment and significantly affect the quality of Adriatic Sea.

Keywords: water quality, wastewater treatment plant, Mediterranean Region, Adriatic Sea, pollution,

Water Concentrations of PAH, PCB and OCP in Istanbul Strait Region by using Semi Permeable Membrane Devices and Sediments

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Water concentrations of polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB) and organoclorine pesticides (OCP) were estimated from the semipermeable membrane devices (SPMD) deployed for 7 and 21 days in the five sites of the Istanbul Strait and Marmara Sea. Performance reference compounds (PRC) were used to determine the site-specific sampling rates of the compounds. The sediment samples from those sites were also analyzed for the targeted pollutants to determine concentrations and patterns. Nonlinear least squares (NLS) method and 80/20 PRC selection method were used to find Water concentrations (Cw) from SPMD. The analyzed compounds estimated by using two different calculation methods were found similar. Cw of total PAHs estimated from SPMD (Cw-spmd) were found between 12-79 ng L-1 and between 7.0-68 ng L-1 for 7 and 21 days of deployments respectively. The highest values of Cw-spmd for two deployments were 0.46 ng L-1 for PCBs and 2.8 ng L-1 for OCPs. Water concentrations estimated from sediment concentrations and Koc values (Cw-sed) were higher in most of the sites than that of the SPMDs deployed in the overlying water.

Keywords: SPMD, PAH, PCB, OCP, Sediments

Visible and UV-A light-induced photocatalysis of formic and oxalic acids with S-doped, Fe-loaded titania

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Semiconductor photocatalysis has been developing into the most promising method for basic and applied chemical utilization of solar energy. The photocatalytic degradation of various organic compounds employing irradiated titanium dioxide (TiO2) is well documented in the scientific literature. However, due to the large band gap of 3.2 eV (387 nm), TiO2 can utilize only a very small part (5%) of UV solar radiation from 300 to 390 nm. Therefore, any improvement of the photocatalytic efficiency of TiO2 by shifting its optical response to the visible spectral range, which accounts for about 43% of the whole solar energy and also the main portions of the indoor artificial illuminations, will have profound positive effects to sustain higher light conversion efficiency. One of the more efficient methods is doping or surface modification with transition and noble metals or with nonmetal atoms such as carbon, nitrogen and sulphur to increase the photocatalytic efficiency of TiO2 in the visible spectrum. S-doped titania (S-TiO2) in particular has received great attention. Loading a co-catalyst onto the photocatalyst oxide surface is one of the well-known methods for photocatalytic activity improvement due to enhancement of adsorption onto the photocatalyst surface and separation of the photogenerated electron-hole pairs. It is also known that iron (Fe) implantation greatly increases visible light activity while retaining UV light activity.

In the present study, visible and UV-A light-induced photocatalysis of aqueous solutions of formic and oxalic acid with S-doped, Fe-loaded TiO2 (SFT) was investigated. The effect of formic and oxalic acid concentrations (50 and 100 mg/L), initial pH (3 and 7) and catalyst concentrations (5 and 10 g/L) under visible or UV-A light on degradation rate was evaluated. The removal efficiencies of formic acid and oxalic solutions (50 mg/L) under UV light irradiation with SFT were 10% and 67%, respectively. During the experimental run conducted with formic acid solutions (50 mg/L), 53 and 40% dissolved organic carbon (DOC) removal efficiencies were achieved for 5 and 10 g/L catalyst concentrations at 120 min reaction time under visible light irradiation at pH 3.0, respectively. At the same experimental conditions the obtained DOC removal efficiencies for oxalic acid were 41% for 5 g/L and 51 % for 10 g/L catalyst concentration. The photocatalytic oxidation process under visible light was generally slower at pH 7 than at pH 3. Increasing the photocatalyst concentration from 5 to 10 g/L increased oxalic acid degradation rate, but decreased formic acid degradation under visible light irradiation. Our experimental results have clearly indicated that SFT has a potential as a photocatalyst that can be activated via visible light irradiation for the photocatalytic mineralization of the studied model pollutants.

Keywords: S-doped Fe-loaded titania, formic acid, oxalic acid, visible light-induced heterogeneous photocatalysis, DOC abatement

The Effect of Urbanization on Water Quantity and Water Quality for Kağıthane Stream Watershed, Istanbul

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Comprehensive models for water quantity and water quality are crucial to protect and improve water resources. These models may also be effective in determining risks such as flood, drought and water contamination. Especially, in urban areas, due to the extreme developments and inadequate infrastructure system, high surface runoff, short time of concentration and poor water quality are observed. The aim of this study is to investigate the effect of urbanization on water quantity and water quality by employing a hydrodynamic model for Kağıthane Stream Watershed. For this purpose, first, a hydrodynamic model is developed by using Environmental Protection Agency Storm Water Management Model (EPA SWMM) which is a dynamic simulation model for the surface runoff that develops on a watershed during a rainfall event. Kağıthane Stream Watershed is located in Istanbul, Turkey. And, Kağıthane Stream has 131 km2 of watershed area and is the most important one of the two rivers flowing into the Golden Horn. The main channel flows through Kemerburgaz and the total length of the stream is 37 km. Although downstream of the channel is restored, upstream of the channel is natural which involves flood risk for residential areas in this region. Then, by using the hydrodynamic model, we simulate the surface runoff generated on the watershed under rainfall events with different return periods. Finally, we select several land use types and investigate their influence on surface flow and pollutant buildup and washoff under different scenarios. Consequently, we observe the possible effects of human activities on surface runoff and water quality in Kağıthane Stream Watershed.

Keywords: urbanization, hydrodynamic watershed model, EPA SWMM, Kağıthane Stream watershed

Oil shale as powerful adsorbent of mineral and organic pollutants

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Morocco disposes of an important oil shale reserve. Its valorization in terms of energetic sources is under investigation, mainly with the increase of the consumption of gas and petrol and its impact on the national budget. On another hand, their activation could lead to a powerful adsorbent for the decontamination purposes.

Chemical activation process was performed on two steps. It consists on using chlorhydric acid (36%) at ambient temperature followed by acetone at boiling point. Four different granolumetric samples were prepared and tested for adsorption of metallic and organic pollutants. Effect of temperature and pH were studied.

Keywords: Adsorbent; Pollutant; Oil shale; activation

Potential toxic risk from heavy metals in Butrinti Lagoon

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The fate of heavy metals in natural environments is a major concern. Butrinti Lagoon is one of the most interesting lagoons situated in the south of the country. Lands around the lagoon have been subjected to an intensive agricultural cultivation. Many chemical fertilizers, herbicides and insecticides used in agriculture in this area emit into the environment and in various forms metals which are harmful to the ecosystem. Also the Ksamil urban emissions may be a threat to the lagoon. The aim of the study is to assess the potential risk that these heavy metals produce in the area of Butrint. In this study were analyzed the spatial and temporal distribution of heavy metals present: in all soil samples of Vurgu field and in the Bufi hills, and sediment, water, algae and bryophytes samples in Butrint Lagoon. Nevertheless the mean heavy metals contents were in permissible limits except for Cr levels in Vurgu field which could be naturally high. The examination of the samples revealed high levels of (Cu, Cd), in several sampling stations of Vurgu field, and high levels of (Pb, Cu, Cd, Cr) in Bufi hills. These results reflect the human local inputs. Cr contents in sediments at some sampling stations are higher than the maximum permissible limits, indicating a transport of certain products in the lagoon as the result of the weathering process. As a result it is necessary an adequate management of agricultural inputs in the area around Butrint, given the fact that their waste constitutes a potential danger to Butrinti Lagoon. The values of Pb in the bottom water (7.61 µg L1) were higher than the established standards and this is caused from urban discharges of Ksamil. Cr values in bottom water (SS6, SS7) were higher than the standards established by EU-2008, and this is influenced by contributions of the tributaries. Cu and Cr are the most accumulated metals in algae and bryophytes. The study results orient us towards a better management of agricultural inputs and urban waste in the area around Butrint, given the fact that this waste constitutes a potential danger to Butrinti Lagoon.

Keywords: Heavy metals, pollution, Butrinti Lagoon, alga and bryophytes

Physico-Chemical Characteristics and water quality assessment from Karavasta lagoon

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The increase of population, human activities, industries and agriculture around the coastal environment are greatly affecting the neutrality of the water system. Lagoon pollution has been increasingly significant over the recent years and this has been found to contribute significantly to environmental problems. The Karavasta complex (40°55'N; 19°30'E), situated in the vast Myzeq coastal plain (western lowlands), is the largest wetland site of Albania. Due to intensive agricultural activities in the area around of lagoon, the soils could be subjected to non-point pollution as for relevance to Lagoon environments. In this context, assessment on physico-chemical parameters and heavy metal contents of water are useful to evaluate the pollution of Karavasta Lagoon. This study aimed to assessing (i) the water quality in the Karavasta Lagoon using the physico-chemical parameters (2) its status to support the living species in comparison with standards lagoon ecosystems. The water and sediments samples have been collected from six selected sites during April 2013. The water temperature in the Lagoon is typically Mediterranean with 21,8 0C in April. Temperature and other chemical and physical parameters are greatly affected by the quality of water that communicates with the Lagoon and also by the precipitation/evaporation ratio. The average values of salinity were 21,3 ppt. were lower than Sea water salinity. The mean value of pH (8.8) and temperature obtained in the water samples are a good indicator for the lagoon, because they reflect two of the main parameters that enhance aquatic life. The mean value of DO at the top 11,6 mg L-1 was encouraging for the biological productivity of the lagoon, because when DO is below 2 mg L-1, many aquatic organisms perish. The lowest values (4,8 mg L-1) is in the sampling stations 1 and in influenced by water coming from drainage. The concentration of Pb, Cd, Cr, and Cu in water of the Karavasta lagoon environment could not be very harmful for the lagoon waters, it should be noted that there is still a possibility of contamination

Keywords: Heavy metals, water quality, agricultural activities, Karavasta Lagoon

Application of qPCR technique for microbial source tracking

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The European Commission's bathing water directive lays down provisions for more sophisticated monitoring, assessment and classification of bathing water quality. It also provides for better and earlier public information about bathing water quality and public participation. Turkey participates in the international Blue Flag campaign to promote sufficient water quality and general environmental standards on beaches and in marinas. The 2012 Forum of Marine Protected Areas in the Mediterranean revealed The Antalya Declaration that initiates unprecedented commitment for coordination in the Mediterranean region, between all the stakeholders. These policies and agreements are lead to pay attention on water resources. Waterborne pathogens can result in human diseases by contaminating public water supplies, recreational water, and aquifers. Fecal contamination of aquatic ecosystems has followed in adverse public health and economic consequences. This pollution can come from a range of point and non-point sources, with potential contributions from many individual sources belonging to wildlife, domesticated animals, and/or municipal wastewater effluents. Rapid identification and remediation of the source of contamination can minimize the impacts of such pollution on the economy, public health, and ecosystem health. Microbial source tracking (MST) is an emerging field that used for identifying sources of fecal contamination in the environment. With MST tools to more clearly identify the source of pollution, water quality decision makers can make more strategic investments to better target reduction in contamination in a cost-effective manner. MST methods can be classified as library-dependent methods or library-independent methods. The latter does not depend on the isolation of targeted source identifier as detection is performed via the amplification of a genetic marker by a quantitative Polymerase Chain Reaction (qPCR). Recently, host-specific 16S RNA encoding genetic markers of Bacteroidales species technology have been developed for various sources of pathogens (human, ruminant, cow, horse, elk, pig and dog) and the method has been applied with reasonable success in the U.S., several EU countries, and Japan. This technique can not only be used to detect, but also to estimate the amount of MST marker present in samples, is becoming more popular due to decreased sample processing times and smaller amounts of variability compared to some cultivation methods. In this work, we will focus on the potentials and limitations of qPCR technique for characterization and identification of fecal pollution sources.

Keywords: water quality, fecal pollution, microbial source tracking, quantitative polymerase chain reaction

Fate of Paracetamol production wastewaters under aerobic and anaerobic treatment

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Paracetamol and acetaminophen are the commonly encountered names denoting para-acetylaminophenol (C8H9NO2) a widely used over-the-counter pharmaceutical applied for relieving pain and reducing fever. The uncontrolled release of this pharmaceutical to the environment is stated to cause a potential ecological risk that requires further investigation (Kim et al., 2007). The negative impact of such a widely used pharmaceutical that arises from human consumption is hard to control. On the other hand a more readily achievable task is to restrict the discharges generated during manufacturing of the paracetamol, which will eventually cause unwanted environmental effects. Bulk paracetamol production generates high strength wastewaters that have COD values of around 20000 mg/l. Paracetamol active ingredients can be manufactured via various routes such as phenol, para nitrochloro benzene, nitrobenzene, para hydroxyacetophenone hydrazine

The objective of this study is to comparatively evaluate the biodegradability of wastewaters originating from paracetamol active ingredient production under aerobic and anaerobic conditions. Assessment of inert COD fractions under aerobic and anaerobic conditions indicated that much better results can be obtained when aerobic treatment is applied. The investigation also covers the toxicity of these effluents towards marine bacteria Vibrio fischeri. A wastewater generation of approximately 1 m3/ton product is observed in the investigated industrial premise. Such a wastewater generation level is in accordance with the literature. EC50 value for raw effluent is determined to be 6.7 % at 30 minutes showing significant toxicity towards Vibrio fischeri.

The experiment run under aerobic conditions is observed to yield an initially inert soluble COD concentration of 130 mg/l (SI) and a soluble residual COD of 225 mg/l, generated as metabolic products, SP. On the other hand, the anaerobic inert COD test conducted on the same wastewater sample shows that this sample initially contained a soluble inert COD concentration of 15785 mg/l and additionally indicated a generated microbial product concentration, SP, of 160 mg/l. The results indicate the suitability of aerobic biological treatment for these wastewaters.

Keywords: Pharmaceutical industry, wastewater, biodegradability

A Neural Network Application for a Ballast Water Electrochlorination System

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Ships' ballast water has been recognized as the principle vector for movement of the non-indigenous species among marine environments. Even though only very small portion of these organisms can survive the rough condition of ballast tanks, this survived organism poses big threat to the new environment they are introduced to. It is estimated that as many as 10,000 alien species of plants and animals are transported per day in ships around the world. There are number of ballast water treatment techniques proposed to eliminate the diverse effect of ballast water translocation. Chlorine disinfection is one of the proposed chemical techniques for ballast water treatment. Chlorine is widely used as a disinfectant all over the globe, however handling and storage of chlorine poses risk for safety of the crew while the chlorine itself causes environmental problem. In situ electrochemical generation of chlorine onboard would have many advantages like eliminating storage and handling of chlorine gas or HOCl solutions. This work has been conducted within the project "BaWaPla – Sustainable Ballast Water Management Plant", funded by the European Union under contract number 031529, which is started at 15/11/2006 and finalized at 15/05/2010. Aim of the project was the development of a new hybrid BW treatment technology (UV, filters and electrolysis) build in a self-controlled BW treatment system. The main objective of the proposed project was the invention of an effective treatment technology incorporating non-permanent, seawater-generated active substances. By producing active substances through electrolysis of seawater, there will be no need to carry or store hazardous and corrosive chemicals onboard. The aim of this study was to optimize a lab-scale chlorine generation system to disinfect ballast water organisms for BaWaPla project. The other objectives of the study were to verify the effectiveness of the Electro Chemical Cell process with different cell types, to reveal the influence of important parameters such as contact time, current density, power input, and salinity on the process performance and to evaluate the kinetics of EC disinfection for ballast water. Chlorine generation by electrolysis of artificial saline water and seawater were investigated. Five different cell types were tested to determine the properties of disinfectant produced under various conditions. A neural network application was used as a non-linear statistical data modeling and a decision making tool. This application provided modeling the relationships between inputs and outputs as well as finding patterns in data. An ANN model has been utilized to find relationship between operational conditions and disinfectant quality parameters, i.e., total residual chlorine (TRC) and free available chlorine (FAC). Figure 1 shows the effect of salinity on disinfectant quality parameters while keeping the other operational conditions constant by the help of ANN model, Figure 2. The experimental results also reveal the rapid degradation of disinfectant which underlines the necessity of simultaneous production-dosing process while decreasing the environmental concerns, Figure 3.

Keywords: Ballast water, Electrochlorination, Neural Network, Chlorine Generation

Fig.1 Effect of salinity on disinfectant quality

Fig.3 Degradation of disinfectant over time

Fig.2 ANN Model
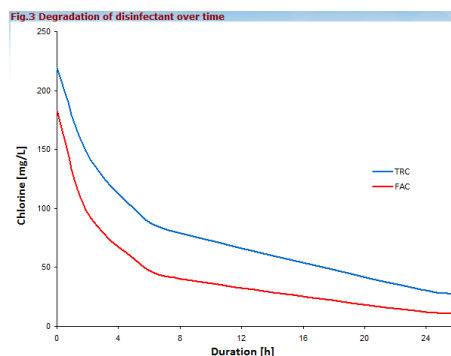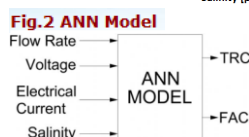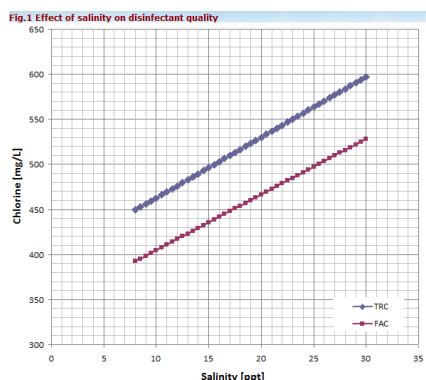
Non point source pollution in an agricultural catchment and the quality of return flows, under Mediterranean conditions

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Land use, especially agricultural activities, change the natural functions of a watershed and affects both water quantity and quality through point and nonpoint sources, and impair aquatic ecosystems. The intensification of the agricultural activity, in particular the irrigated agriculture, increases the use of the agrochemical products, and the problems in the soil and water bodies. The study watershed is located within the Idanha Irrigation Scheme, Idanha-a-Nova, Portugal, and it covers an area of 189 ha. Climate is typically Mediterranean; the topography is slightly sloppy; the area of the catchment is well drained (12.2 m ha-1); the predominant soil classes are Cambisols and Luvisols. The agricultural activity is developed in two different seasons; the winter season where the farmers produce especially winter cereals, and the irrigation season where they produce typical crops in this region (corn, sorghum, tobacco and pasture). A hydrological station was installed at the outlet of the watershed. At the beginning of this study the water samples were collected almost once a day; now we have a multiparameter probe to collect data continually. Computer simulation models provide an efficient and effective alternative for evaluating the effects of agricultural practices on soil and water quality at basin level, and provide alternatives to avoid or reduce the degradation of the environment. AnnAGNPS model was selected as the simulation tool to be used in this study. Some conclusions were possible to take from this study, by analyze the collected data and the results of simulation output: the water derived to the basin study to be used in irrigation has a good quality, and also the water returned to the natural drainage meets largely the quality standards (nitrogen, salinity and sediments) not compromising its use downstream; the nitrates load depends, all time, of the availability in the soil and the runoff volume, due to its solubility; the total daily load of sediments not shows a direct relation with de runoff volume, except when it has a sufficient energy to detach and carry out, as in the extremes events.

Keywords: Non point source, water pollution, rainfed and irrigated agriculture, catchment level, simulation models.

Ozone mass transfer from a clean single bubble to industrial wastewater for phenol degradation

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The aim of this work is to compute, by Direct Numerical Simulation (DNS), the ozone mass transfer with chemical reaction from a clean spherical and ellipsoidal single bubble at different Reynolds numbers. The reaction rate is considered for different pHs and temperatures. We note that the chemical reaction between ozone and phenol contained in industrial wastewater is considered in aqueous phase. Corresponding transports equations are solved and characterised by the Reynolds and the Peclet numbers. The rate of the ozone mass transfer from the bubble to the aqueous phase can be characterized by the Sherwood number (Sh). The influence of hydrodynamics, interface deformation and chemical reaction on Sherwood number is performed by numerical simulations. Indeed, hydrodynamics results are validated by comparing the drag coefficients with those of the other literatures. Thereafter, the effect of chemical reaction, bubble form and Reynolds number on ozone mass transfer is presented.

For the clean spherical bubbles, the simulation results agree with the theoretical models.

The figures 1a and 1b show, respectively, the concentration fields around a clean spherical bubble for the ozone mass transfer without and with chemical reaction.

Keywords: Degradation of phenol, ozone, mass transfer, bubble, Sherwood number, chemical reaction

Figure 1 a
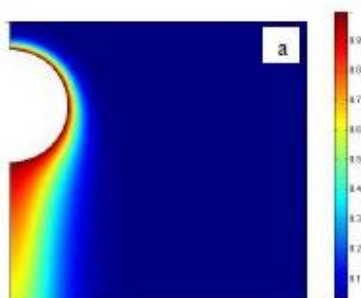
Concentration fields around a clean spherical bubble without chemical reaction

figure 1 b
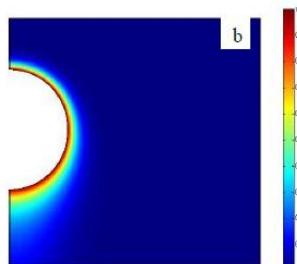
Concentration fields around a clean spherical bubble with chemical reaction

Major Coastal Engineering Works: Monitoring and management of environmental impacts and risks: A Case-Study from the Central Mediterranean (Malta)

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The Mediterranean coastline has been significantly transformed over the past decades mainly due to coastal tourism and related developments. Such transformation often involved major coastal engineering works such as marina developments which lead not only to habitat loss but also to risks of degradation of water and sediment quality. Being the smallest island-state in the region with the highest population density, Malta is an ideal case-study to assess such impacts as well as to evaluate the efficacy of their environmental management.

The paper will present and discuss the significance of data from a long-term compliance marine monitoring programme related to the development and operation of a major marina in Malta, involving major excavation works to develop a new marina basin able to hold 130 berths, complete with breakwater and other facilities. The monitoring programme (1996 to 2003), aimed at identifying and manage associated risks to the marine environment (including Posidonea meadows). For management purpose, a set of environmental objectives and quality standards were initially set for the various water and sediment parameters to be monitored (transparency, nutrients, chlorophyll, dissolved oxygen and levels of microbiological indicators in the water column, as well as levels of petroleum hydrocarbons and antifouling organotins in superficial sediments) and then subsequent monitoring served as surveillance against risks of environmental deterioration. The paper will provide useful information on the dynamics and trends in water and sediment quality resulting from such major coastal engineering works, on how such trends may be related to associated changes (and possible recovery) of Posidonia meadows as well as the efficacy of surveillance monitoring against set environmental standards.

Keywords: marinas, impacts, water sediment quality, surveillance monitoring

Biomonitoring of selected contaminants in shellfish, Mytilus galloprovincialis, from the coastal area of Croatia during the period from 2000 to 2009

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Biomonitoring of contaminants (Cd, Pb, Cu, Zn, Cr, HgTOT, lindane, PCBs and DDTs) in shellfish, Mytilus galloprovincialis, was conducted at 18 sites distributed across the entire coastal area of Croatia once a year over the period 2000-2009. Based on the obtained data pertaining to metal levels in shellfish, it can be concluded that the best status was observed at sites located in the outer estuaries of the Neretva and Krka rivers as well as in the Lim Bay area under submarine freshwater influence, while the poorest status was observed in the areas under anthropogenic impact, e.g. ports, semi-enclosed bays and industrial areas. Statistical analysis of data showed an upward trend for all metals during the period of investigation. The increase in metal concentrations appears to be the result of enhanced industrial activity during the indicated time period, mostly metal production and processing industry which showed more than 190 % growth throughout the period from 2000 to 2008.

Analysis of data with regard to organic pollutants in shellfish revealed lower concentrations of lindane in comparison with DDT, while concentrations of PCB compounds (Aroclor 1254 + Aroclor 1260) were significantly higher in relation to chlorinated pesticides. Highest concentrations of organic pollutants were, similar to metals, established in the areas under anthropogenic influence, however, a decreasing trend was observed at most sites. The decrease in the levels of chlorinated pesticides (lindane, DDT compounds) was more distinguished, which was to be expected considering that the use of lindane has been banned in Croatia since 2001, while the ban on the use of DDT was enforced in 1972. Moreover, there is no national legislation prohibiting the import and use of PCB compounds.

Keywords: Biomonitoring, contaminants, Mytillus galloprovincialis, coastal waters

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Effect of Soil Management on Terbuthylazine Behaviour in an Olive tree crop Soil at Southwest Spain

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Contamination of surface and groundwater in the Guadalquivir River basin by herbicides has been shown to be closely related to the very intensive and extensive olive crop in that area (Hermosin et al. 2013). Also, the South Spain climate and geographic characteristics contribute to make a worse scenario. The aim of this work was to evaluate two soil managements (cover crops and conventional tillage) in the soil behavior of the herbicide terbuthylazine, very widely used in olive crop, and as related to its water presence. Particularly, to know the soil processes affecting the persistence of terbuthylazine herbicide in a soil devoted to olive crop (Benacazón, Seville, SW Spain) by comparing the same soil under cover crops (SCC) and conventional tillage (PA and PB) managements. These soils were sampled at the field and the experimental assays were carried out in the lab to measure the herbicide soil sorption (adsorption-desorption), dissipation and leaching processes. In parallel, a complementary field experiment was carried out at the conventional tillage area by herbicide application in two selected plots (PA and PB) which were sampled during three months. Soil PB is the same as PA but without previous terbuthylazine field application and SCC is the same as PB and PA but with cover crops established during 8 years; all of them in the same area of study. In lab experiments, higher adsorption was found in SCC soil than in PB soil, mainly due to the higher SOM (soil organic matter) content of SCC. Furthermore, this adsorption was very irreversible in both soils. Soil incubation experiments (62 days) did not show relevant differences in terbuthylazine dissipation between PB soil and SCC soil, which is a surprising result, because SCC management generally enhance soil microorganism population and usually it could to increase the herbicide degradation. Soil column leaching experiment showed higher and faster terbuthylazine leaching in PB soil (68%) as compared to SCC soil (20%), also due to the higher SOM content of SCC versus PB, and as a consequence of the enhanced irreversible soil adsorption process. The field study showed a terbuthylazine half-life of 35 days, recovering 15% of herbicide applied after 85 sampling days. The temporal evolution in the soil profile of field herbicide residues versus time and rain showed that field losses are mainly related to the amount of rain and hence to the leaching and runoff processes. The lab results suggest that cover crops are not only are relevant to decrease pesticide runoff process, soil losses or erosion, but also they could to contribute in decreasing the herbicide soil leaching losses, by increasing soil irreversible adsorption and hence decreasing groundwater contamination.

Chlorinated pesticide endosulfan treatment using bio-barrier

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Biobarrier is effective ve affordable in-situ treatment technologies. In this study, endosulfan of organachlorine pesticide type was used. The significance of chlorinated hydrocarbon type of pesticides, in addition to their toxicitiy on irrelevant organisms, stems from the fact that they can remain and spread in ecosystems for a long time. Endosulfan creates residual contamination of groundwater and soil ecologies. Diffuse pollution, but it can be controlled or treated in place by the natural microorganism groups. With work; a system was prepared for examine the elimination of endosulfan using biyobariyer. To control the process of biyobariyer and flow conditions were carried out to determine the tracer substance at column reactor. As filling material, Manisa (Gördes) natural zeolite was used. Two sets of experiments have been conducted in a column reactor. In the first set, a constant supply of endosulfan at pH=6,5 and mineral nutrient has been provided. In the second column reactor, the rate has been raised to pH=8,5 with 0,1N NaOH and glycose was supplemented as additional carbon source. At the end of the experiment, for the first column, after 7,5 months, the rate of endosulfan removal is 89%; in the second reactor, the endosulfan removal rate was found as 99% after 3,5 months. In the second set of studies, a constant nurture of pH=6,5 endosulfan and mineral nutrient was supplied in the same environmental conditions. As the result of the experiment, after a four months period, 100% endosulfan removal was attained in two column reactors.

Keywords: endosulfan, biobarrier, chlorinated pesticide

Removal of Chlorophenols with using Acclimated Activated Sludge Microorganisms

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Industrial developments and the compounds during the industrial products synthesis are a reason for increasing of phenolic compounds in pollution load in our environment. Some of the industrial products of phenol derivatives given to environment, synthetic resins, plastics, biocides, disinfectants, dyes, antioxidants, explosives and some phenolic compounds used in photography. Additionally some of the phenolic compounds produced as a byproduct produced during the processing of solid and liquid fuels. Phenolic compounds are found in the content of the wastewaters which have been sourced from the industries of construction chemicals manufacturing, textile, paint manufacturing, furniture manufacturing, plants and pesticides manufacturing around Nigde.

Phenols are named as derivatives of hydroxyl benzene. They can be found in domestic and industrial wastewaters, natural waters and waters can be used with the aim of supplying drinking water. Chlorination of this type of waters causes the formation of chlorophenols which has smelling and unpleasant tastes.

Chlorinated aromatic compounds are the one of the environmental pollutant due to producing of considerable amount of chlorinated aromatic compounds and these products shows resistance to biodegradation, there being toxic, deposits at the biota and environment.

In this study, removal of chlorophenols which were generated with chlorination of synthetic wastewater studied. For formatting of chlorophenols, Phenol (%99.9 Merck) and HOCl (%99.9 Merck) were used. Between 0,01-0,05 mol/l concentrations were used for the media. Phenol and COD removal efficiency were found as %97, %92 respectively.

Keywords: Phenol, Chlorophenol, biodegradation, activated sludge, acclimated microorganism.

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Determination of Enteric Bacteria Density and Vertical Variations in the Gulf of Gemlik (Marmara Sea)

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The Gulf of Gemlik is a trench which excludes itself from Marmara Sea with a ridge having a depth of 50m and has a geographic structure that can affect all biotic and abiotic environmental factors it contains. Within the Gulf of Gemlik, there are many fault lines which are compatible with the ones on land and some of them control the gulf formation. Not only the season differentiation but also the temperature differentiation through vertical line affects biodiversity and bio-density. Moreover, there are several medium and large scaled industrial enterprises in Gemlik District which takes place just beside the gulf where anthropogenic activity is intense. As industrial facilities carry on services in different sectors and all wastes are discharged in the Gulf of Gemlik, the gulf gets polluted fast.

In this study, density and distribution of enteric bacteria, isolated from the Gulf of Gemlik, through horizontal and vertical line selected on the gulf were investigated and the availability percentage of Escherichia coli and Enterococcus faecalis which are the most common types of enteric bacteria was calculated. For that purpose, water samples were taken from 7 different depth levels of 5 selected stations (surface, 5m, 10m, 15m, 20m, 30m, 50m) and identification of enteric bacteria were determined monthly between the dates of July 2010-May 2012.

Apart from periods when seasonal differentiations were apparent, vertical density changes of bacteria were remarkable. While values of enteric bacteria decreased down to 15 m, they showed a tendency to increase up to 30 m in terms of both temperature and bacteria density. It was detected that particularly hydrogeological conditions on land can be similar to the ones within sea and can change the conditions of ecologic environment around those zones. In order to monitor these changes visually, GIS was employed and density differences have been detected clearly on maps created seasonally.

Keywords: Enteric bacteria, biodiversity, biodensity, Gulf of Gemlik, Marmara Sea

Catecholamine Levels of Freshwater Amphipods From Different Habitats and Their Alterations Induced by Temperature Stress

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The access to geothermal energy becomes increasingly important in view of the finite nature of fossil resources [1]. The impact of these energy usages in terms of temperature changes on the ecology of aquatic subsurface and surface habitats has still not been adequately investigated [2]. It is commonly known that the rise of water temperature causes stress in animals of aquatic ecosystems [3]. Catecholamines (CA) play an essential role in the physiological processes which prepare the body for physical activity in stress situations [4]. The neuroendocrine mechanisms inducing stress in crustaceans are poorly understood [3] and different from those of vertebrates, even though evidences point to CA involvement [5].

In our studies the presence of CA (noradrenaline, NA; adrenaline, A; dopamine, DA) in individuals and homogenates of the groundwater crustacean Niphargus inopinatus was detected for the first time and measured with HPLC/EcD [6] As a representative of surface water amphipods Gammarus pulex was examined similarly in the experiment described below. Protocols with detailed preparation and measuring instructions for each amphipod were created.

Catecholamine levels found in a first series of unstressed (N.) inopinatus with 2318. for NA, 1366 for A and DA 71340 (all pg/mg dry weight) were generally high enough to allow analysis of single individuals despite of a mean body weight of only 0.7 mg. Especially the outstanding average level of DA initiated further chemical verification by derivatization and UPLC/TOF-MS measurement.

Dependence of CA concentration changes on temperature stress (+6 °C and +12 °C) was compared in another series of samples between N. inopinatus and G. pulex The mean basic CA concentrations found here in unstressed N. inopinatus were 2042.5 (pg/mg DW) for NA, 0 (pg/mg DW) for A and 67971.1 (pg/mg DW) for DA. The corresponding data for G. pulex were 9.8 (pg/mg DW) for NA, 6.5 (pg/mg DW) for A and 68.2 (pg/mg DW) for DA. The temperature treatment showed that temperature stress (+6 °C and +12 °C) caused a first appearance of adrenaline in N. inopinatus. Furthermore an increase of A and NA and a decrease of DA could be detected at +12 °C in G pulex [7]. This CA pattern was detected before in the scallop Chlamys farreri as a response to stress [3]. The CA levels of N. inopinatus were higher than those of G. pulex in all experiments. Average dopamine levels of N. inopinatus were about 1500 times higher than in G. pulex.

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Keywords: Amphipod - Niphargus - Gammarus – Catecholamines – Temperature stress

Experimental Study of a submerged aerated filter performance with sequential aeration

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Aerated submerged Filters, or Biofilters, are widely used as biological wastewater treatment all over the world. In Morocco, the use of Biofilters was limited because of their high technicality and high energetic cost due to the important amount of air for biological activity, which limits the use of this system despite its high efficiency compared to the main other extensive (Natural Aerated Lagoon) and intensive (Actived Sludge) techniques used until now.

In order to optimize energetic consumption of biofilters and understand who much sequential aeration can influence biofilters performances, experiments were carried out in laboratory scale using a cylindrical PVC column of 1.5 m of height and 0.11 m of diameter and filled by porous plastic media. The hydraulic regime was on batch mode. Air was injected at the bottom of the column using a porous rectangular diffuser. The air flow rate was 0.075 L/s. Synthetic wastewaters were prepared with initial Chemical Oxygen Demand of 900 mg/L. Biofilter performance was followed in different seasons (autumn and spring) while biodegradability kinetic was calculated.

It has been shown that the performance of biofilter was 97% after 12 h and 9 h respectively for continuous and sequential aeration of 30 mn/h (equivalent to 4.5 h) to an average temperature of 18°C. Further experiments also were carried out during a warm period (T = 25°C), the elimination performance was 98% after only 6 hours for continuous aeration and sequential aeration of 30 mn/h, and 9 h for sequential aeration of 15 mn/h (equivalent to 2.25 h).

These results have shown that increasing temperature has favorable effect for the application of sequential aeration to aerated submerged filters, and gives an important increase to biodegradation kinetics. In spring and summer seasons, the sequential aeration mode gives the same performance compared to continuous aeration, which allows a consequent profit in energy.

Keywords: Biofilter, Sequential aeration, Chemical Oxygen Demand, Porous Media, Performance.

Assesment of Long Term Pollution Loads in Porsuk River

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Porsuk Dam Reservoir (PDR) is located on the Porsuk River. The reservoir is mainly fed by Porsuk River, Kunduzlu Stream and waters coming from Kargin Regulator of State Hydraulic Works. PDR supplies drinking water for Eskişehir. Therefore, the water quality in Porsuk River and in PDR is important. The water quality in Porsuk River is under stress due to several point and non-point pollution sources present in the borders of Kütahya and Eskişehir Provinces. Industrial and domestic wastewater discharges, erosion, runoff from agricultural sites located along the river, loads coming via leakages, and contaminated streams are the main pollution sources that deteriorate the water quality of Porsuk River.

In this study, pollution loads into Porsuk River within the watershed of PDR will be studied. For this purpose, the water quality data of 9 stations belonging to State Hydraulic Works (DSI) were obtained for 1986-2010. The water quality characteristic values were evaluated for selected parameters such as NO_3-N, Total Kjeldahl Nitrogen (TKN), TN, PO_4-P and TP. The 90 percentiles of the data were considered. The same method was also applied to determine the characteristic flow values. Then, maximum critical pollution loads were calculated. Results were evaluated by taking the locations of point pollution sources into account. Especially the increase in the nitrogen loads downstream of Kütahya Wastewater Treatment Plant and Nitrogen Factory can easily be seen. Moreover, phosphorus loads show a huge increase in the station located downstream of Kütahya Wastewater Treatment Plant. When the contribution of each source was examined in detail, it was seen that the big portion of the pollution loads was arising from Kütahya Wastewater Treatment Plant and Nitrogen Factory. Therefore, even some improvements applied in the treatment plants of these sources may reduce the nitrogen and phosphorus loads to the river significantly.

Keywords: Pollution load, Porsuk River, water quality

Water quality issues in Northern Greece - A hybrid membrane process as a possible solution

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In recent years the quality of water sources has become a substantial issue that Mediterranean countries have to deal with. Mediterranean region had high quality water resources, although in the last decades gradual deterioration of those can be noticed due to lack of long term programming and control of human activities (industrial, agriculture and urban) along with the geological characteristics of some areas which results in creation of pollution problems to both surface and underground aquifers. In Greece especially, several cases of high concentrations of heavy metals, pesticides, refractory organic pollutants, etc. have been observed in recent years. Central water treatment plants are unable to deal with all these problems and specific/supplementary treatment is necessary for the treated water to be reused. The design of optimized processes for smaller scale in situ treatment of partially polluted water can be a flexible solution for the lack of fresh, good quality water resources.

In this study the current status of water quality in Northern Greece and the main issues are presented. Furthermore, a hybrid ozonation - ceramic membrane filtration process is proposed to deal with some of the aforementioned problems. The experimental apparatus consisting of two ceramic membrane modules, connected in series. In the first module, ozone gas is transferred to the polluted water through the small pores of a ceramic membrane, resulting in the formation of micro-bubbles, aiming to increase the efficiency of the oxidation process. Subsequently, the ozonated treated water is driven to the second membrane filtration module, where suspended particles, metal ions and organic pollutants are further separated. The design of the new hybrid unit aims to offer flexibility for different contamination problems and reduce the energy demand for water purification.

Keywords: Northern Greece, Hybrid Process, Ceramic Membranes,

Seasonal variation and inputs of the nutrients loads to the estuary of Pamisos River (Messinia - Peloponnese) Greece

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Pamisos river basin, located at the southern part of Peloponnese, covers an area of 619 Km2, is the biggest riverine area in the Prefecture of Messinia and belongs to type RM2 according to the Classification Criteria of Typology for flowing waters of the Mediterranean countries. The average altitude is <400m, the geology is mixed, it is characterized by high seasonality and hilly and plain terrain predominates. A key feature of the river basin is its rural character. In the region, dominated by olive groves (25%), agricultural land with significant areas of natural vegetation and complex culture systems predominate, while large areas are occupied by natural environment (mainly Sclerophyllous vegetation). In a smaller river catchment area (Lygdou R.), which flows into Pamisos R. a few meters before its estuaries, the agricultural activity prevails, especially rice fields, permanently irrigated land and olive groves. A characteristic of the latest river basin is the presence of the industrial zone in the catchment area. The marine ecosystem of the Messinian Gulf is characterized, by relatively low nutrient levels, while the relatively higher values recorded are characterized as local. It is noteworthy, that in the context of assessing the ecological status of water bodies in Greece according to the Water Framework Directive (2000/60/EC), the river section of Pamisos was found to be significantly impaired.

Six sampling sites were established for nutrient analysis from the estuaries of Pamisos R.during the wet and the dry period of the three last years. The samples were taken in polypropylene vials, which were frozen until the analysis at the ISO 17025 certified laboratory of H.C.M.R. The determination of nitrates, nitrites, phosphates and silicates was performed by an automatic nutrient analyzer according to the standard methods while the ammonium salts were determined by a spectrophotometer. Also the N:P ratio was calculated. The station in Ligdou estuaries, despite the fact that it belongs to another river basin (Ligdou R.), was included in the sampling sites, since it flows into Pamisos R., for a more objective assessment of the chemical status of the study area. A detailed picture of the nutrient input from Pamisos River into the Messinian Gulf arises from the results obtained. The concentration of phosphates showed significant spatial variation and the highest value was recorded at the station of Ligdou during the wet period. In general, this station seems to curry the highest load of many of the parameters measured and it charges the estuaries of river Pamisos and the Messinian Gulf with considerable amounts of nutrients. Nitrates were rather higher during the dry period at almost all stations while ammonia, on the other hand, was recorded higher during the wet period. The results indicate that a considerable charge transfer of both nitrogen and phosphorus takes place from the mouth of Pamisos R. into the Gulf. The large agricultural areas present in combination with the great olive oil activity and the vast quantities of olive oil wastewaters generated annually are responsible for the enrichment of the ecosystem with these elements.

Keywords: nutrients, Pamisos, estuaries, agricultural activity.

Acute Effect of Synthetic Estrogen 17 Alpha-Ethinylestradiol on Biological Carbon Removal Processes

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The existence and persistence of estrogenic chemicals in aquatic environment is a problem that may affect public and ecosystem wellness. Estrogenic compounds including 17 alpha-ethinylestradiol are known to cause endocrine disruption in wildlife and humans. Ethinylestradiol (or 17 alpha-ethinylestradiol) is a synthetic hormone, which is a derivative of the natural hormone estradiol. In this study, acute inhibitory impacts of ethinylestradiol (EE2) were determined by respirometric analyzes on biological carbon removal systems. Activated sludge taken from a domestic wastewater treatment plant in Istanbul was acclimated to synthetic peptone mixture. A 12 liters of an aerobic batch reactor with a hydraulic retention time of 1 day and a sludge age of 10 days was installed and operated with the acclimated sludge. The system was fed with synthetic peptone mixture (600 mg COD/L) during five months. Batch experiments were started with the biomass seeding alone to obtain the initial endogenous oxygen uptake rate (OUR) level. Substrate/substrate-EE2 mixture was added to the reactor at the desired S_0/X_0 ratios. Two concentrations of EE2 (1 mg/L – 5 mg/L) were used during acute experiments. During batch experiments each system was monitored by OUR, Chemical Oxygen Demand (COD) and Polyhydroxyalkanoates (PHAs) measurements. Acute respirometric experiments conducted during this study provided useful information about the inhibitory effect of EE2. It can be concluded that acute addition of different dosage of EE2 does not affect COD removal efficiency but affects the maximum oxygen uptake rate levels leading to an inhibition effect of 30 and 65 % for 1 mg/L and 5 mg/L EE2 addition, respectively. Modelling results indicated that EE2 addition has no effect on microbial kinetics.

Keywords: Synthetic estrogen, ethinylestradiol, peptone mixture, aerobic conditions, acute impact, oxygen uptake rate

Evaluation of Water Quality within the Watershed of Porsuk Dam Reservoir

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Porsuk Dam Reservoir (PDR) is located at 25 km west of Eskişehir. The dam is designed and constructed to protect Eskişehir from flooding, irrigate Eskişehir and Alpu Plains and supply drinking water for Eskişehir. Therefore, the water quality in the streams and in the reservoir within the watershed of PDR is so important. The big portion of the watershed of PDR is sited within the borders of Kütahya and Eskişehir provinces. As a result, the water quality of the reservoir is affected by pollution sources present in the borders of both provinces.

In this study, the water quality within the watershed of PDR was evaluated by using the water quality data of 21 sampling locations which 11 of them within the PDR and 10 of them on streams. While sampling locations on streams were selected based on potential contributions from industrial areas and inputs from tributaries, conjunction and mixing points of streams with PDR are considered in the locations selected within PDR. Furthermore, sediment samples were collected at five locations within PDR. Evaluation was done for each parameter by comparing the results of field studies conducted in January, April, August and September 2010 within PDR with limit values. According to water quality results, PDR exhibits concentrations above the hyper-eutrophic range. The results of sediment analysis were evaluated together with water quality results. As a general conclusion, besides Porsuk River, Kunduzlu Stream, Regulator of State Hydraulic Works, Sofça and Sobran Villages have negative affect on the water and sediment quality of PDR. For streams, the water quality results were compared with the limit values given in Table 1 of the Turkish Water Pollution Control Regulation. Then, the class of each parameter was determined. While most of the parameters fall into Class I in the upstream of Porsuk River, they fall into higher classes after domestic and industrial wastewater discharges. When the chlorine, sulphate, boron and fluorine concentrations are examined, it is seen that there is a huge increase after Seyitömer Thermal Power Plant. Felent Stream exhibits high BOD and COD values. High COD and BOD load can be as a result of discharge from sugar refinery located on Felent Stream. DO concentration starts to decrease after the discharge from KMWWTP and reaches its minimum at the sampling location downstream of the industrial facilities. High total CN is observed in the sampling locations at the downstream of nitrogen factory and industrial facilities. CN concentrations at these locations exhibit Class IV property. Similarly, Zn at the downstream of industrial facilities is also higher than that in other sampling locations. Therefore, pollution sources should be taken under control.

Keywords: Porsuk, water quality, sediment

Intracellular Carbon Storage Phenomena of a Biomass Exhibiting Improved Settling Properties

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The study aims at evaluating the intracellular carbon storage phenomena of a biomass fed with a readily biodegradable substrate and subjected to a feast-famine regime under sequential anaerobic/aerobic conditions. For that, a 2 L lab-scale sequencing batch reactor (SBR) with an height-to-diameter ratio (H/D) of 1.2 was fed with acetate and operated at an exchange rate of 10%, resulting in 900 mg/L COD inside the reactor at the beginning of the cycle. Total cycle time was 6 h and cycle configuration was as follows: 11.5 min feeding, 140 min anaerobic phase, 190 min aerobic phase, 1 min settling, 10.5 min discharge, 18.5 min idle. The biomass cultivated in the system had excellent settling properties (SVI<40 mL/g) and COD removal performance (>98%). Cycle-evaluation experiments revealed that the biomass had intracellular carbon storage traits typical to the systems operated at an anaerobic/aerobic sequential mode with a feast-famine regime: a decrease in sCOD in the bulk liquid accompanied by increasing trends in intracellular PHA inclusions during the anaerobic phase, and then an initial sharp decrease in bulk-liquid sCOD due to rapid growth on the readily biodegradable substrate leaking from the anaerobic phase followed by a decelerating acetate consumption eventually reaching to an asymptotic level thru the end of the aerobic phase, and an apparent decrease in PHA pools due to slow growth on intracellular C-storage polymers upon depletion of the externally available C-source. Real-time oxygen utilization rate (OUR, mg O2/L.h) profile obtained at the aerobic phase was in agreement with the trends recorded for the bulk-liquid sCOD and intracellular PHA pools, revealing growth on external C-source and intracellular PHA reserves. A sharp decline was recorded in the OUR profile collocating to the time point when PHA dropped down to its low asymptotic level, together marking the cease of growth on externally available and internally produced C-sources.

Keywords: glycogen; polyhydroxyalkonates; sequencing batch reactor; sludge volume index intracellular storage

Nutrient Modelling in Coastal Waters of Izmit Bay

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The ECOLab module of the MIKE 3 model based on the coupling between a hydrodynamic part and an ecological part which accounts for mainly the nutrient enrichment was utilized to study nutrient cycles and their contribution to euthrophication in the Izmit Bay located in the Sea of Marmara. The water quality data, including on-site parameters, produced between November 2005 and November 2006 were used for model runs and validation. The samples were collected from 8 different points on the cross-section of the bay at different depths considering the bottom point of the sea bed in order to represent the third dimension. The ecological model used in this study allows creating 3D images/results that simulate the actual situation. The spatial distribution of state variables such as, Biological Oxygen Demand species (BOD dissolved, BOD suspended, BOD sediment), Dissolved Oxygen (DO), Ammonia, Nitrate and Phosphate concentrations were investigated. The processes, used as arguments in the differential equations involved in ECOLab, were advective transport, biological, chemical and physical transformation process and settling. According to the model results, the discharges of main streams have a big influence on the variation of the BOD, especially in the coastal and shallow regions. Additionally, the modelled ammonia, nitrate and phosphate concentrations were determined at the discharge points of the four main streams reaching the bay. An important point detected from the ECOLab results was that the variation of the modelled DO concentrations was found to be between 0.5 and 13 mg/L which was thought to be affected by current velocity values and higher aeration rates in the bay.

Keywords: Nutrient dynamics, Eutrophication, Ecological modelling, Three-dimensional modelling, Model evaluation, Izmit Bay

The Comparison of Ultrasound and Hydrogen Peroxide Treatment of Bulking Sludge

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Formation of bulking sludge in the aeration tank of activated sludge process is one of the most important problems in decreasing the overall of activated sludge process. One of the causes of bulking sludge is the excessive growth of filamentous bacteria in the activated sludge.

In essence some alteration in operational practice is required to control sludge bulking. Specific control measures include operational control, chemical addition or process modification (in increasing order of investment and cost). Two approaches are generally used. These are Biocides and Flocculants. Biocides, which are toxic, are used to kill the filaments but not the floc formers. Biocides are not selective as such, but as the filaments grow into the surrounding liquid the biocide will have maximum effect on filaments and minimum effect on the aggregated floc-forming bacteria. The most widely used biocides are chlorine and its derivatives (e.g. sodium hypochlorite) which are toxic at low concentrations and should be added to the returned activated sludge (RAS). In contrast, hydrogen peroxide and ozone are very reactive and are dosed directly into the aeration tank where they release oxygen as they decompose. Also, physical treatment as well as ultrasonic treatment of sludge can be applied in controlling bulking sludge. Ultrasounds include a wide range of frequencies between 20kHz and 10MHz. When acoustic energy is supplied to a liquid, gas bubbles are formed and grow by absorbing gas and vapor from the liquid.

This study deals with the comparison of ultrasound (mechanical) and hydrogen peroxide (chemical) pre-treatment on the performances of bulking and foaming sludge. On the use of hydrogen peroxide to be effective in a certain doses international activated sludge is implicated. Carefully dose ultrasound of the return activated sludge can be also very effective. In Antalya, a total of two plants (1 east side and 1 west side) in activated sludge treatment plant, the effect of various doses was determined in hydrogen peroxide and ultrasound. The cell inactivation, deformation and floc structure are evaluated of the bulking or foaming sludge.

Keywords: Ultrasound, Hydrogen peroxide, activated sludge, Bulking sludge, Biocides

Investigations of pollutants of the groundwater of Serbia by chemometric techniques

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Various chemometric techniques (Hierarchical cluster analysis-HCA; Discriminant analysis-DA and Factor analysis-FA) were used to analyze the quality of groundwater data sets. Seventeen water quality parameters: the cations Na, K, Ca, Mg, the anions Cl, SO_4, NO_3, HCO_3 and nine trace elements Pb, As, Mn, Ni, Cu, Cd, Fe, Zn and Cr were measured at 66 different key sampling sites in ten representative areas (low land- Northern Autonomous Province of Serbia, Vojvodina and central Serbia) for the summer period of 2009. HCA grouped the sample sites into four clusters based on the similarities of the characteristics of the groundwater quality. DA showed two parameters, HCO_3 and Zn, affording more than 90% correct assignments in the spatial analysis of four/three different regions in Serbia. Factor analysis was applied on the log-transformed data sets and allowed the identification of a reduced number of factors with hydrochemical meaning. The results showed severe pollution with Mn, As, NO_3, Ni, Pb whereby anthropogenic origin of these contaminants was indicated. The pollution cames from both scattered point sources (industrial and urban effluent) and diffuse sources agricultural activity. These samples may not be suitable for human consumption; the water quality belongs to class III/IV (contaminated). The Fe anomalies (7.1mg/L) in the water from the Vetrnica site can be attributed to natural sources, such as the dissolution of rock masses and rock fragments. The serious groundwater contamination with As (25.7-137.8µg/L) in the area of Banat (Northern Autonomous Province of Serbia, Vojvodina) and a sample No. 9 at the Great Morava River requires urgent attention.

Keywords: Ground-water quality of Serbia • Cluster analysis • Factor analysis • Discriminant analysis • Groundwater pollution sources

Physico-chemical characterization of waste waters of the area of Annaba (Algeria)

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Our Survey is focused on the physico-chemical characterisation of the waste waters of urban origin in the agglomerati on of Annaba.

The physico-chemical analysis of these waters concerned the measure of several parameters: pH, conductivity, orthophosphates, turbidity ammonium, chlorides, nitrites, hardness (TH), DCO, DBO 5.The gotten results showed that the waste waters of the region constitute a sharpe of non negligible pollution and could carry attack seriously to the environment.

These results reflect the few purification stations, from where the region faces environmental problems,inciting a relatively fast action, that consist to the setting up of purification intallations and while respecting the dismissal norms of the waste waters once purified rigorously, what will bring a substantial improvment of the public hygiene and the pratection of the water resources.

Keywords: Waste waters, pollution, control, environment, Annaba

Complexation of chromium ion with chitosan and their derivatives nanoparticles and whiskers

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Chitosan is a polysaccharide belonging to the glycosaminoglycans family. It is usually produced from chitin found in the shells of arthropods. The capacity of chitosan to complex metallic ions is one of the most interesting properties. However, many aspects of this property are still unknown.This work presents the behavior of chromium ion with chitosan and their derivatives nanoparticules and whiskers. This interaction was reveled by spectroscopy FTIR and Scaning Electron Microscopie (SEM).The first result obtained of this work shown that the type and structure of a complexant biopolymer is a determinate factor for the complexation of chromium ion. Our objective of this study is approximate the optimal conditions for recuperation of metallic ion from wastewater.

Keywords: chitosan, nanoparticles, whiskers, complexation, wastewater.

Reuse of treated wastewater Station of Sewage From Hassi Rmel(Algeria)

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More demand for water grows, the available water resources are scarce while simultaneously and consequently the volume of sewage released increases. In this context, the reuse of wastewater is an interesting way to both meet demand and protect resources.The objective of this study is to evaluate the effectiveness of the treatment plant in Hassi R'Mel order to reuse its water for agriculture and industry.Overall comparison of the results of analysis of wastewater and clarified for selected parameters. Showed good initial abatement.In view of the overall results, and in accordance with Algerian standards, we can say that a strong possibility to use these waters for irrigation, otherwise they can be used in industry (in testing hydrostatic).

Keywords: wastewater treatment plant, reuse, hydrostatic testing, corrosion

Enrichment factor in assessment of river sediment contamination in Serbia

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Sediments in surface water are most vulnerable to various forms of pollution, including trace elements due to their ease of access for the disposal of urban and industrial wastewater. European catchments are under pressure from ever-increasing water stress and land-use change, especially those with a high conservation value in the Mediterranean area. Because of that, European rivers show a wide variety of pollution problems. In this research, concentration of some selected trace metals (Cd, Cu, Co, Mn, Cr, Ni, Pb and Zn) are measured in rivers in Serbia. Sediment samples were analyzed in order to assess the extent of sediment contamination, and to distinguish natural and anthropogenic input. Quantification of contamination is made using the metal enrichment factor. Enrichment factor was calculated using the expression: EF = (M/Y)sample / (M/Y)background, where M is the concentration of the potentially enriched element and Y is the concentration of the proxy element. As elements for normalization in calculating the enrichment factors were used Fe and Al, and obtained results were compared.

River sediments in Serbia showed a wide range of trace element enrichment. In general, the order of the average EF values was Cu > Zn > Cd > Co > Pb > Ni > Mn > Cr. According to the categories, these findings indicate that Cu, Zn and Cd enrichment was high. From the pollution point of view, the EF of Cu in the river Pek (35.03) were the highest among the elements in the investigated sediments, suggesting significant contamination at this locality. There is also shown a significant anthropogenic contribution to the elements in the sediments, mainly from the Ibar, Great Morava, West Morava and Tisa. The results indicated that EF value depends on the element used for normalization. The differences in the values of EF are usually not large, except at some localities (Tisa, Danube, Ibar). EF values were higher when Al is used as an element for normalization.

Keywords: enrichment factor, river sediment, contamination, trace metal

Hormones in drinking water

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Drinking water in the Czech Republic is mostly prepared from the surface water. The corresponding technology is mostly based on sedimentation of solid particles, coagulation by addition of ferric sulphate, removal of precipitate containing impurities like colloid substances of organic origin (humic compounds, peptides, soaps etc.) as well as inorganic compounds (clay particles too small to be removed by sedimentation, precipitates). The next step is deacidification by aeration or by addition of calcium hydroxide, followed by filtration and disinfection by chlorine. This technology is in many cases ineffective for removal of new type pollutants like drug residuals which are present in surface water as result of their incomplete removal during waste water treatment.

This study is focused on the analysis of residual hormones in drinking water, which is prepared from valley reservoir water (12 mil. cubic meters) in the Czech-Moravian Highland, which is considered as one of the cleanest parts in the Czech Republic. The catchment area of this dam covers relatively densely populated agricultural area with population in villages and small towns equipped with sewage system. The water treatment plant uses standard technology. The content of target compound from the group of natural as well of synthetic hormones used as contraceptives (estrone, estradiol, estriol, ethinyl estradiol) was determined using grab sampling along the technological line. Passive samplers of POCIS type were also exposed in these points for 4 weeks. Water samples were treated by SPE, isolated compounds as well as the extracts from exposed passive samplers were analysed by liquid chromatography with mass spectrometric detection using electrospray ionization. The results document incomplete removal of target compounds. The analysis of residual hormones in the selected water treatment plant will be repeated after finishing of its extensive reconstruction, whose principal contribution will be the addition of active carbon adsorption technology, which is considered as suitable for the complete removal of the drug residuals.

Keywords: hormones, drinking water, passive sampling, HPLC/MS

Determination of methylmercury in fish tissues

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Contamination of biotic components of the environment by metals is a serious problem mainly due to their bioaccumulation potential. One of the most often monitored metals is mercury and especially its most common and also the most dangerous form – methylmercury, which represent threats to the health of humans and wildlife that depend on its exposure from fish consumption [1].

This study is focused on the evaluation of contamination of fish from the Svratka river (South Moravian Region, Czech Republic) by methylmercury. For purposes of this study chub (Leuciscus cephalus) was chosen. This species is widely spread in Czech flows and due to its sensitivity to pollution is often used as a bioindicator organism. Samples were caught at two sampling points – upstream and downstream of a municipal wastewater treatment plant (WWTP) Brno Modrice.

Methylmercury was extracted from muscle and skin. Tissues were homogenized and extraction was performed according to a method published by Maršálek and Svobodová [2] and modified by Tuhovčáková [3]. The method was based on methylmercury leaching by hydrochloric acid and its subsequent extraction to toluene. Analysis was carried out using a gas chromatograph with a micro electron capture detector (GC-μ-ECD). DB-17 capillary column (30 m x 0.25 mm, 0.25 μm; J&W Scientific) under a simple temperature program (80 °C hold 1 min, at 15 °C/min to 180 °C) was used for the separation of samples components. A base of the method was taken from literature [4], particular conditions were optimized.

The trueness of the method was proved using a certificated reference material ERM® – CE464 with content of methylmercury 5.50 mg/kg. Limit of detection (LOD) and limit of quantification (LOQ) was 1.5 μg/kg and 5.0 μg/kg, respectively. Recovery of the method was 98.58 %.

Results of this study are summarized in Fig. 1, which shows average concentrations (each sample was extracted three times and each extract measured three times). Fish no. 1–15 and no. 16–30 were caught upstream and downstream of the WWTP, respectively. Content of methylmercury in individual fish closely related to their age, size and weight. The highest concentration of methylmercury (865.7 μg/kg) was found in muscle of a fish caught upstream of the WWTP. It was determined that muscle concentration of methylmercury is significantly lower in downstream fish than in those lived upstream. Over limit concentrations in muscle (according to Czech legislation) were detected in six cases, five fish were caught upstream of the WWTP and only one downstream.

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Keywords: methylmercury, GC/ECD, fish tissues

Determination of Pathogen Microorganism Levels in the Hospital Laboratory Wastewaters

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This study is made to see the types and amounts of pathogen microorganisms in the wastewater of hospital laboratories ans also the removal capacity in the disinfection-neutralization systems of these organisms. In this pilot study, The Training and Research Hospital in Ankara was chosen as study field. Pathogen microorganism levels in the monthly inlet and outlet waters in the medical waste neutralization and disinfection system of the hospital laboratory were checked on 5-month periods. Findings led by the samples were pathogen bacteria (Pseudomonas aeruginosa, E. Coli, Acineto baumanii, CNS) and viruses (Anti-HCV, Anti-HIV, HBsAg, HAV-IgM, Toxoplazma-IgM, Rubella-IgM and CMV-IgM). As a result of these analyses, no bacteriological or pathogen viruses were detected in outlet waters whereas some were detected in the outlet waters of some samples. Another conclusion is that the package treatment system Works efficiently with regards to pathogen removal. The results of the study are especially important in revealing that there are no standards for pathogen microorganisms in the discharde regulations in our country. The fact that in the wastewaters of hospitals where no treatment process is followed can contain seriously pathogenic organisms is another remarable results with regards to environmental and public health.

Keywords: Hospital laboratory wastewaters, pathogens, disinfection, neutralization.

Industrial Polymers and Their Use in Environmental Engineering

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Polymers have been widely used in our daily lives by the development in synthetic polymers production during the last century. As in different industries, either synthetic or natural polymers are applied to the problems in Environmental Engineering. First, inorganic polymers such as poly aluminum chloride were used as primary coagulants while organic polymers were only used as flocculation aids in coagulation – flocculation processes. However, the health concerns about aluminum – based coagulants (Alzheimer disease) and pH dependency of inorganic coagulants led researchers to find out different coagulants. Then, both natural and synthetic polymers could be produced with the desired properties, having ability to use as primary coagulants. Particularly synthetic polymers (polyacrylamide and its derivatives) were widely applied for the treatment of water (removal of turbidity and some metals), wastewater (removal of organics and some toxic chemicals like phenol) and even soil pollution since their important properties like molecular weight could be controlled during production of the polymers. Similarly, some health problems associated with synthetic polymers, especially with their monomers, were realized. After that, natural polymers such as chitosan, alginate and starch which are environmentally compatible were investigated for their use in water (as coagulants and/or flocculants) and wastewater (particularly removal of heavy metals and dyes) treatment. Recently, molecularly imprinted polymers are getting attention. These types of polymers are particularly effective for selective removal of trace pollutants, such as endocrine disrupting compounds, from complex environmental matrices. As a result, polymers were extensively used to solve environmental problems and it seems that they will also be used in our near future. For this reason, this paper will be a short review which especially focuses on application of organic and molecularly imprinted polymers in Environmental Engineering.

Keywords: molecularly imprinted polymers, organic polymers, water treatment, wastewater treatment

Optimization of the HS-SPME method coupled with GC/ECD to determination of methylmercury in water

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The aim of this study was the optimization of SPME extraction method and the optimization of GC/ECD method. Mercury is a hazardous element which is found in all components of the ecosystem and in terms of environmental pollution it is considered to be a global pollutant. Thanks accumulate and persistent character of methylmercury, it is one of the most toxic substances present in the environment and biota. The methylation of mercury occurs in the aquatic environment. Methylmercury is in low concentration in the water. The danger lies in its bioaccumulation. By activity of bacteria living in the sediment gets methylmercury out of the water to phytoplankton, zooplankton, other aquatic animals and through the food chain right to human (Houserová et al., 2006). There are highly sensitive methods through which we can determine very low concentrations of substances. These procedures include the SPME method.

Solid-phase microextraction (SPME) is the analytical method described for the determination of methylmercury in water matrices. The fiber with a stationary phase is placed into a closed SPME vial and it is exposed to certain conditions (time, temperature, pH, etc.). Then the fiber is placed into the injection space of gas chromatograph, where the temperature is very high and the substance adsorbed on the fiber desorbs immediately and continues to columns to separate and identificate (Sporgert, Pragst 2000). "Head-space" (HS-SPME) is used for the extraction of volatile compounds from the sample, water in our case. The advantage of this approach is high purity of extract (Barra et al. 2007; Sporgert, Pragst, 2000).

The analytical procedure involves derivatization of ionic mercury with sodium tetraethylborate in a sample vial and following extraction with a silica fiber coated with polydimethylsiloxane (PDMS). Standard of methylmercury for the optimization of SPME method was used. The fibre, time, temperature and pH, were optimized for the extraction method by HS-SPME. Methylmercury was determined by gas chromatography with electron capture detector (GC/ECD).

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Keywords: methylmercury, SPME, optimization, GC/ECD

Residues of Selected Organohalogenic Pollutants in the South Moravian Surface Water, the Czech Republic

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The present paper deals with the aquatic ecosystem contamination in the South Moravian region by selected organohalogenic pollutants residues. Polychlorinated biphenyls (PCBs), organochlorine pesticides (OCHPs) and polybrominated diphenyl ethers (PBDEs), which are still included in the group of priority pollutants, were selected as monitored contaminants.

PCBs are frequently and commonly detected as organohalogen pollutants under the secondary contamination [2]. The monitoring of PBDEs has recently been extended because many everyday products include commercial mixtures that contain these organic pollutants as they are so-called flame retardants. Their concentration is significantly lower than the concentration of PCBs in the aquatic ecosystem [1]. OCHPs are lipophilic, chemically stable and not much biodegradable. Their occurrence in the ecosystem originates mostly from old burdens [3]. Serious negative impact of these substances on the environment is their toxicity, high persistence and accumulation in biological systems, resulting in health hazards not only for people but also for animals [1, 2, 3].

Selected contaminants were monitored in the surface water of the Svratka and the Svitava rivers, both flowing through the Brno city. Target analytes were isolated from surface water samples using an optimized method based on cold extraction. Column chromatography was included for the purification of extracts during preanalytical sample preparation. Identification and quantification of selected analytes were performed by gas chromatography with electron capture detector.

Obtained results were used to assess the levels of examined contaminants residues and to estimate the burden of the aquatic ecosystem of selected rivers in the South Moravian region.

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Keywords: PCBs, pesticides, PBDEs, surface water, monitoring, GC/ECD

Evaluation of the level of water contamination by synthetic musk compounds

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This study is focused on the assessment of selected musk compounds in the waste and surface water. Synthetic musk fragrances are semivolatile organic compounds that are discharged to the environment through human activity (Peck and Hornbuckle, 2006). Musk compounds, as a new type of emerging contaminants, are widely used as fragrance additives in a vast array of scented consumer products, including perfumes, lotions, sunscreens, shampoos, soaps, deodorants, air fresheners, cleaning products and laundry detergents. After these products are consumed, about 77 % of synthetic musks are drained into the sewer system and reach the wastewater treatment plants (WWTPs). Without complete removal, the synthetic musk compounds in WWTPs contaminate the environment with the discharge of effluents into lakes and rivers (Hu et al., 2011). Due to their extensive use, musk compounds have become ubiquitous in the environment, and they are prevalent in surface water, raw sewage, sewage effluents, sludge, suspended particulate matter and sediment. Synthetic musks have also been measured in biota living in contaminated aquatic environment (Shek et al., 2008). The aim of this work was determination of selected musk compounds in real samples of waste and surface water from the area of Brno city and evaluation of the results. Four representatives of linear musk compounds (Dihydromyrcenol, Cyclohexylethylacetate, Arofir, Cyclacet/Jasmocyclene) and two of polycyclic musk compounds (Galaxolide, Tonalide) were selected for the monitoring. At first optimization of selected method was performed and then this method was used for own determination. Analytes were isolated by solid phase microextraction (SPME) from sample. The identification and quantification of analytes was carried out by gas chromatography – mass spectrometry (GC-MS).

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Ecological Effects of Aquacultures on Hellenic Coastal Ecosystems

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The rapid expansion of aquaculture activities, particularly fish and mussel farming, has become a matter of concern of the scientific community because of the environmental effects on both the water column and the sediments. The impact of mariculture is mainly due to the increased nutrient loads that might easily induce eutrophication with increased oxygen consumption due to the increased organic matter supply. Fish farms in particular produce a net input of inorganic and organic nutrients.

In this paper we present the nutrient and dissolved oxygen distributions at nine selected coastal areas of Greece directly affected by fish cultures, based on data from six sampling periods between September 2012 and February 2013, in order to assess the environmental effects of the aquacultures on the Hellenic coastal marine ecosystems.

The selected stations were located at eight different areas of central Greece: Maliakos gulf, Atalanti and Larymna Bays in North Evoikos gulf, Alivery, Nea Styra and Marmari bays in South Evoikos gulf, Itea and Antikyra Bays in Korinthiakos Gulf.

Dissolved Oxygen (DO) concentrations in general followed the temperature temporal variability. Lower DO value (3.38 mL/L) was recorded at the station located in Marmari Bay in South Evoikos gulf in November 2012 probably due to consumption of organic material.

An increase in nitrite and nitrate concentrations was observed during winter period especially at stations located in Malliakos gulf, probably due to the terrestrial input of nutrients through Sperchios river. It is noteworthy that significant high ammonium concentrations were recorded during September at the station located in Aliveri Bay, in South Evoikos gulf. This station is affected by a large fish culture. September is considered to be the period of maximal supply of feed to caged fish and nutrient loss to a highly stratified oligotrophic environment.

The evaluation of the ecological quality of the study coastal areas based on nitrate and ammonium concentrations according to the classification scale applied for the greek coastal areas, with relatively lower nutrient concentrations compared to other European coastal areas, showed that 60% of nitrate data and 47% of ammonium data revealed a high mesotrophic or eutrophic state of the areas studied. A significant enrichment of the study areas in inorganic nitrogen has been recorded which has probably affected the functioning of the coastal marine ecosystems. It seems that the selected aquacultures deteriorated the environmental quality of the coastal marine environments in Greece. For this reason, the continuous monitoring of the coastal areas affected by aquacultures is very important.

Keywords: Aquacultures; Greece; ecological

Optimization of irrigation amounts to avoid a waste of irrigation water in order to minimize the risk of surface runoff -case study Menemen plain (Turkey)

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The evaluation of the field water cycle under deficit irrigation plays an important role in studying mechanism of field water and water quality. In this study, the agro-hydrological Soil–Water–Atmosphere–Plant (SWAP) model for small irrigated area in Menemen Plain was applied to reveal im-portant terms of the water balance for evaluating the water quality in Gediz River. Specific areal data (meteorological, soil structure, water resources, and crop properties) were used as an input with water balance, crop growth and drainage modules. Simulations were performed for the period 2008-2011. Dif-ferent water balance models were obtained for each irrigation and water quality was evaluated for the under applying conditions. For this, various irrigation amounts (cotton1, cotton2, cotton3) were tried using SWAP model and optimum irrigation amount for this area was determined. Crop type was selected as cotton because it was main crop in plain. According to water balance for the applying conditions (cotton1 irrigation), GWL, drainage and run-off resulted from, rainfall and irrigation amount according to models. In irrigation season run-off and drainage level was determined as high and GWL was obtained as low. High run-off values were directly reasoned for high irrigation amount in the area. Optimum irrigation amount was determined as 350-400mm in terms of crops water need and run-off. According to water quality results, run-off originated from irrigation could be caused high TDS and EC values in irrigation season. Low TDS and EC values can be attributed to high rainfall, which causes significant dilution. The intensive agricultural activities in the area such as fertilizer caused for high concentration of nitrate, phos-phate especially in irrigation season and also high run-off level. High levels of run-off from agricultural land and leakage affect the water body. Consequently, water quality is resulted from rainfall and irrigation amount in wet and dry season respectively. In dry years, NO3-N and o-PO4 values were observed high. It can be caused by domestic and industrial wastewater discharge. It was concluded that the use of the SWAP model in a distributed way is a useful tool to analyze all the components of the water balance for a whole irrigation system. Due to Menemen Plain has intensive agricultural facilities, it has been continuously observed. Irrigation amount should be adjusted according to crop type and soil properties.

Keywords: SWAP, Water quality, Menemen Plain, Gediz River

Determination of Nutrients in Sediments and Water of Gökçekaya Dam Lake in Turkey

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The quality values of the sediment of Gökçekaya Dam Lake established over Sakarya river was reviewed and its pollution profile was tried to be detected by this study. The study area has a characteristic distinguishing from the studies carry out previously. This dam lake takes place between two dam lakes over Sakarya river; the main stream feeding the lake comes from Sarıyar dam lake. By this study, the change in the natural systems in sediment and water quality of Gökçekaya dam lake which has a different entry water feature from other dam lakes were reviewed from the aspect of nutrients.

Within the scope of the research, samples were taken on monthly basis during the field studies planned for a period of 1 year. Samples were taken from 5 stations determined upon the preliminary feasibility study on Gökçekaya dam lake. The analysis showed that Gökçekaya Dam Lake, which was formerly an oligotrophic lake, has become a mezotrophic lake and that the Lake has mezotrophic characteristics due to the sudden changes (including household waste water inflow, opening Sarıyar Dam Lake shutters) in certain periods and in stations. Also, the low phosphorus rate which is a restrictive nutrient in terms of eutrophication in freshwater, shows that the eutrophication risks in the lake is very low. During the monitoring period, it was observed that each parameter was very low and the phosphorus concentration increased in spring and autumn. The phosphorus amount in the bottom sediment causes the phosphorus value in water to increase.

Keywords: Water and sedimant quality, nutrients, dam lake.

Preconcentration of heavy metals using ceria-coated silica-magnetite nanoparticles prior to their determination by ICP-OES

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Magnetically driven separation techniques have received considerable attention in recent decade because of their great potential in analytical systems [1,2]. In addition, nanoscale size materials offer large surface area and high reactivity of sorption, as the absorptive properties of ceria vary significantly with morphology, shape and surface area [3-5].

In this study, we investigate the application of silica-modified magnetite nanoparticles coated with CeO2 for the analytical enrichment and determination of sub-parts per billion concentrations of heavy metals from water samples. To obtain the ceria-coated nanoparticles, Ce(NO3)3•6H2O and hexamethylenetetramine were mixed with silica modified magnetite nanoparticles under mild stirring at 90oC, for 24h. The synthesized nanoparticles were characterized by BET, XRD, IR and SEM.

After extraction, the nanoparticles with the adsorbed target metal ions are easily separated from the aqueous solution by applying an external magnetic field. The complexed metals are desorbed using a solution of HNO3 and subsequently determined with ICP-OES. The effect of pH, temperature, microextraction time, desorption conditions and ionic strength on the extraction efficiency of the metal ions are investigated and properly optimized.

Under the optimized conditions the detection limits are in the range 0.01–0.37μg/l. The applicability of the nanomaterial was verified using a real sample matrix and the accuracy of the method was evaluated by recovery measurements on the spiked samples.

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Keywords: Heavy metals, ICP-OES, Magnetic nanoparticles, Enrichment

Bioaccumulation and Biochemical Impact of Lead and Cadmium in Freshwater Alga Chlamydomonas Reinhardtii and Marine Alga *Thalassiosira weissflogii*

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Photosynthetic algae are in the basis of the nutrition chain, with very serious impact on the sustainability and health of water ecosystems. Pollution of water systems with heavy metals cause both adsorption on cell walls and insertion of these pollutants into the cells, with all the consequences to the higher forms of life, and finally to humans. On the other hand, the examination of the accumulation of heavy metals on algae living in a polluted environment may provide valuable information on the condition of the ecosystem, thus, the exploration of the potential of algae to be used as bioindicators for heavy metal pollution is important. In this study, we examine the behavior of two photosynthetic algae, *Chlamydomonas reinhardtii* (freshwater) and *Thalassiosira weissflogii* (seawater) exposed to a range of lead and cadmium concentrations. Growth curves of these two organisms were constructed for each heavy metal concentration, showing the differences on the tolerance of the two species to the heavy metals under examination. The percentage of the adsorbed vs. the total accumulated metal was estimated and the biochemical impact of the inserted metals in the cells was examined. For this, cells of the two species exposed to Cd or Pb were lysed and heavy metal-induced proteins were searched in the cytoplasm by SDS polyacrylamide gel electrophoresis. Coomasie and bromobimane (with the assistance of UV illumination) were used for the visualization of the proteins in the gels in order to examine the full protein profile and sulfhydryl group-containing proteins (mostly metallothioneins), respectively. –SH containing proteins were quantified by Ellman method. Our data are evaluated towards the possibility of using the two unicellular species under examination as bioindicators for heavy metal pollution of freshwater and/or marine environments.

Keywords: *Chlamydomonas reinhardtii*, *Thalassiosira weissflogii*, Cadmium, Lead, Bioaccumulation

Evaluation of diatomite and chalcedonite as a reactive materials protecting groundwater in trafic infrastructure

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Pollution of groundwater by heavy metals is one of the important environmental problems. Among the sources of pollutants e.g. municipal and industrial waste landfills, oil spills, harbour and channel sediments, etc., one of the most critical are road run-off and snow melt. In the case of incorrect environment protection in the vicinity of roads the pollutants may migrate to groundwater causing hazard to sources of potable water. Road run-off is a complex mixture of contaminants e.g. heavy metals, de-icing agents, organic compounds and water suspensions of solid substances. One of the methods to prevent the migration of pollutants to groundwater is imposing the flow of polluted water through a reactive material built-in e.g. in drain-well or drainage ditch. This paper focus on evaluation of the possibility of raw minerals (diatomite and chalcedonite) application in groundwater protection. The analyses of the reaction properties of materials tested have been carried out using batch tests for heavy metals in multi-component solution (Cu, Cd, Ni, Pb and Zn). Initial solutions were prepared using analytical salts (Merck). The equilibrium tests were carried out using 2 g of mineral sorbents and 100 mL of multi-component solutions. The initial concentrations of metals were varied from 0.2 to 2,5 mg/L and the contact time was 72 hr. Aqueous solution without adsorbates were used as control samples. The final concentrations of the heavy metal ions in the solution were measured by atomic absorption spectroscopy – AAS (Thermo Scientific, USA).

The experimental data obtained were fitted to the Freundlich, Langmuir, Redlich-Peterson and Temkin adsorption isotherms. The sequence of selectivity ion exchange for diatomite is: $Pb2+> Cu2+>Cd2+>Zn2+>Ni2+$ and for chalcedonite is: $Pb2+>Cu2+> Zn2+>Cd2+>Ni2+$. Adsorption quantity of lead and nickel at equilibrium for diatomite are 0.119 mg/g and 0.099 mg/g, respectively. Chalcedonite is characterized by adsorption quantity at equilibrium of 0.120 mgPb/g and 0.031 mgNi/g. The removal ratio R (%) of particular heavy metals from aqueous solution was as follows: (1) for diatomite Cd – 91.0 %, Cu – 99.4 %, Ni – 83.0 %, Zn – 83.2 % and Pb – 99.6 %, (2) for chalcedonite. Cd – 43.9 %, Cu – 88.8 %, Ni – 26.1 %, Zn – 50.9 % and Pb – 100.0 %. The present work demonstrated that diatomite and chalcedonite are a promising reactive material to protect groundwater in road infrastructure.

Keywords: diatomite, chalcedonite, heavy metals, groundwater, road infrastructure

Kinetics studies of copper ions removal from aqueous solution using various biosorbents filling permeable reactive barriers (PRBs)

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Permeable Reactive Barriers (PRBs) technology has been developed for groundwater protection in areas contaminated by inorganic and organic substances. The PRBs are an in situ treatment zones that passively reduce concentrations of pollutants occurring in the subsoils. This technology based on natural attenuation processes which include sorption, precipitation as well as chemical and microbiological reduction. The crucial step in PRBs designing is the choice of most effective reactive material which are low-cost, commonly available and should be compatible with the subsurface environment. Recently, many papers claiming the use of biosorbents for water decontamination in industrial and agricultural wastewater. In this paper biosorption by these waste-based biosorbents can be used as a reactive materials in permeable reactive barriers. However, like all heavy metals, it is potentially toxic but copper is a metal that is widely used in industry and is an essential element in human health. Biosorbents from fruit and vegetable wastes like plum stones, tomato and apple peels have high sorption capacities and therefore can be used as a reactive materials. A series of experiments were conducted in a batch system to evaluate the effect of time on copper uptake rates and contact times needed to achieve equilibrium. The solutions used in batch tests were prepared using analytical salts (Merck). The kinetic tests were carried out using 1 g of biosorbents and 50 mL of copper solutions (30 mg/L). To determine the time in which the adsorption equilibrium has been achieved, a set of sorption measurements of Cu^{2+} concentration were undertaken after 10, 20, 30, 40, 60, 180, 300, 420, 1440, 1800, 2880 and 3240 minutes. The final concentrations of the heavy metal ions in the solution were measured by atomic absorption spectroscopy – AAS (Thermo Scientific, USA).

The experimental results indicated that the apple and tomato peels have been better sorption properties of other biosorbent. Adsorption quantity of copper at equilibrium are 1.472 mg/g and 1.251 mg/g, respectively. Obtained adsorption quantity for plum stones is 0.796 mg/g. The removal ratio R (%) of copper from aqueous solution was as follows: (1) for plum stones 50.2%, (2) for tomato peels 78.7%, and (3) for apple peels 92.5%. Equilibrium in solutions has been stabilised after 40, 2880 and 420 minutes, respectively.

Keywords: biosorbents, copper, permeable reactive parries, groundwater contamination

Musk compounds in industrial and municipal waste waters

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The presented study was aimed at examining of four synthetic fragrances concentrations in industrial waste water from the cosmetic producing firm Dermacol, joint-stock company. The selection of target compounds was made with regard to their application in the manufacturing process. Two of selected musk compounds belong to the group of polycyclic musks (Galaxolide – HHCB, Tonalide – AHTN), whilst the next two compounds are nitromusks (Musk Ketone – MK, Musk Ambrette – AMB). Technological waste water in this company is treated by ultrafiltration before discharge to the municipal sewage. This cleaning method is based on semipermeable membranes with pore size 1 – 100 nm, therefore it is able to separate particles with size within the range 0.1 - 5 µm from the solution. This size range corresponds to the molecules with relative molecular mass from 10^4 to 10^5. Thus it is possible to remove oil emulsions, colloids, macromolecules, eventually also viruses and bacteria. Samples of waste water for analysis were taken for two-week period daily before treatment by ultrafiltration and after it, so the effectiveness of ultrafiltration could be assessed. Target analytes were isolated from the waste water by solid phase microextraction using polyacrylamide fibre and direct immersion, isolated compounds were directly analysed by GC/MS using HP-5MS column (20 m x 0.1 mm x 0.1 µm). Samples of untreated waste water were strongly milky and showed significant matrix effects, Therefore they had to be diluted with distilled water in a ratio of 1:5 or 1:10. Samples of waste water after treatment by ultrafiltration were clean and without important matrix effects, therefore they could be analysed directly, without dilution. Quantification was realized using standard addition method.

The levels of musk compounds in untreated waste water were quite high in case of Galaxolide (most often in hundreds of ng/mL) and Tonalide (tens of ng/mL). Levels of Musk Ketone and Musk Ambrette were negligible which corresponds with their minimal use in production. The concentration of Galaxolide and Tonalide in treated waste water were almost in all cases in low tenths of ng/mL, which is a proof of high efficiency of ultrafiltration in removal of musk compounds (97.9 – 99.7 %). Therefore it could be concluded that Dermacol Company Brno is under normal operation only minor (insignificant) point source of wastewater pollution by musk compounds.

Keywords: musk compounds, waste water, SPME, GC/MS

Assessment of contamination level of aquatic ecosystem in Svratka and Svitava rivers by selected veterinary antibiotics, Czech Republic

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The work was focused on the assessment of contamination level of aquatic ecosystem of the Svratka and Svitava rivers in Brno city and its surroundings by residues of selected veterinary pharmaceuticals. Specifically, the work dealt with the isolation and concentrations determination of selected antibiotics from the group of sulfonamides in samples of surface water and bottom sediments from two rivers flowing through the Brno city, which is the second largest city of the Czech Republic (approximately 400,000 inhabitants). Pharmaceuticals investigated included ten sulfonamides (sulfaguanidine, sulfadiazine, sulfathiazole, sulfapyridine, sulfamerazine, sulfadimidine, sulfamethoxazole, sulfadoxine, sulfaclozine and sulfadimethoxine). Antibiotics, including sulfonamides, are a large group of pharmaceuticals whose consumption in both human and veterinary medicine is still growing. In both human and animal body they are metabolized and excreted in the urine or faeces, while 30 to 90 % of them are excreted in active form. In this way, antibiotics in their original or metabolized form can enter the environment where they can accumulate, persist and thus negatively affect ecosystems, including water ecosystem where there are toxic especially to aquatic organisms. Veterinary antibiotics are for the environment often more hazardous than those used to treat people. Animals consume up to 60 % of antibiotics not only for veterinary treatment but in some countries also as a feed supplement. The occurrence of residual antibiotics in the environment then results in an increased incidence of resistant bacteria, which may in future become a potential threat to human health [1, 2, 3, 4]. The target analytes were from samples of water and sediments isolated using optimized methods. The efficiency of the methods was verified using analytical standards of selected pharmaceuticals. For the water samples, solid phase extraction (SPE) was used for pre-concentration and purification of the sample as well as for extraction of monitored sulfonamides. For the sediment samples, pressurized solvent extraction (PSE) using a combination of high pressure and high temperature, and methanol as a suitable solvent, were used. Solid phase extraction was used for purification and pre-concentration of sediment extracts. Final identification and quantification of selected analytes was carried out by high-performance liquid chromatography (HPLC) coupled with diode array detector (DAD).Thanks to the obtained results it was determined the amount of residues of selected veterinary antibiotics and thus assessed the water ecosystem burden in selected rivers in South Moravian region.

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Seasonal Variations of nutrients and chlorophyll-a in the coastal waters of the Kapıdağ Peninsula (Marmara Sea)

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This first comprehensive study was carried out on current ecological quality status of the Kapıdağ Peninsula between the years of 2011 and 2012. The samples were collected seasonally from 5 different depths (0.5-30 m) at 3 stations determined from shore to offshore. During the study, temperature, salinity and dissolved oxygen levels of the seawater ranged between 7.5-26.0 °C, 18.06-34.54 ppt and 2.77-10.33 mg L-1, respectively. Nitrate+nitrite-N (0.01-5.39 µg-at N L-1), ammonium-N (0.01-0.79 µg-at N L-1), phosphate-P (0.01-1.48 µg-at P L-1) and silicate-Si (0.52-21.18 µg-at L-1) concentrations were measured, and also chlorophyll a values ranged between 0.02-4.21 µg L-1. The chlorophyll-a concentration is an important biogeochemical quantity monitored, a present pigment in all phytoplankton species and, for this reason, commonly used as an index of phytoplankton biomass. The spatial and temporal patterns of Chl-a concentration seawater temperature and nutrients are important oceanographic characteristics with important implications for sustainable management of fisheries and aquaculture. In autumn-winter months, high Chl-a concentration was found along the station 3, and lower values was observed in summer. This high Chl-a concentration could be related to the nutrients input from land through rivers discharge and anthropogenic effects.

Keywords: Nutrients, chlorophyll-a, water quality, Kapıdağ Peninsula

Life cycle assessment as a tool for controlling the development of technical activities: application to the treatment unit of surface

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Cycle Assessment (LCA) is gaining widespread acceptance in the field of support systems for making environmental decision-making. Indeed, the way environmental problems are seen and tackled by such an approach, comes within the framework of sustainable development thinking. LCA actually enables listing and quantification of environmental burdens and related impacts over the whole life cycle of a product, process or activity, 'from cradle to grave' according to the accepted expression.

The objective of this study is to show how a life cycle assessment approach can be used to direct the development of technical activities according to environmental considerations.

The case study deals with the introducing the preventive treatments into the environmental management of our companies and especially to introduce the concept éco-to conceive and that of economy of the resources first. As field of study we chose the sector of metal industry.

The goal is to propose a step ACV, which can make it possible the company to cross the step towards the design of respectful products of their et environment because of their relationship with the environment (use of raw material, of energy, absence of die of recycling...) for that we have to use software SIMPRO 5.0. The finality of this work is to be able to place at the disposal of the industrialist a method of éco-design, which will enable him to integrate ecological dimension upstream manufacturing processes (volume, design, materials...) and with dimensions of other concerns such as the cost and the technical feasibility of the product.

Keywords: Life Cycle Assessment, Simapro, Eco design, treatment unit of surface

Polluted water resources in the oil field of the Agri Valley (Basilicata, southern Italy)

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All stages of oil exploitation -beginning with exploration and production and ending up with the worldwide use of petroleum products -are, as a matter of fact, under no actual legal control and therefore accompanied by avoidable but not avoided strong environmental pollution. These activities can cause severe damage to the environment, particularly when they take place in populated areas rich of underground and superficial waters, with agricultural activities particularly driven in full respect of biological rules and human needs, and with naturalistic and cultural heritage to be protected, as the in Agri Valley (Basilicata, southern Italy). The valley hosts both the largest oil field in continental Europe, with 26 active oil wells, 1 reinjection well, a large oil pipeline, an oil refinery, and one of the richest Italian areas for natural originally unpolluted waters, inclusive of 22 rivers and streams, about 650 natural springs with an average annual flow rate of 3.550 l/sec., 22 hydrogeological structures, and an artificial freshwater reservoir (Pertusillo Lake) that provides waters intended for human consumption to Basilicata and Puglia regions. Environmental controls are very poor. The Viggiano oil refinery is located just 2,5 km north to the Pertusillo reservoir and oil wells are distributed along the eastern and northern margins of the reservoir, even in the recharge areas of aquifers. Hydrocarbon contamination is widespread in air, food (honey), soil and waters. Benzene and toluene have been found in the groundwater near the oil refinery. Hydrocarbons occur in drinking water wells. Hydrocarbons and carcinogenic Polycyclic Aromatic Hydrocarbons were documented in waters and sediments of the Pertusillo reservoir: 17 sediment samples were collected and analysed by the local association EHPA (2012) and by Basilicata ARPA (2012). They documented total hydrocarbon concentrations up to 559 mg/kg, that is 9 times the threshold value for soils (60 mg/kg; Dlgs.152/2006) taken as reference measure, since this value is lacking for lake sediments in the Italian legislation. The highest concentrations of hydrocarbons in sediments occur along the eastern margin of the Pertusillo lake, where the oil wells occur, and in particular at the mouth of two very small streams that drain the area of the Costa Molina 2D reinjection well. Waters show high concentrations of total hydrocarbons too, reaching up to 6.458 microgr./l, that is 32 times the threshold value of the Italian legislation for waters of class A2 (200 microgr./l; Dlgs. 152/2006) like the Pertusillo ones. The amount of hydrocarbon pollutants in the Pertusillo waters, largely exploited by population for drinking (previous purification), domestic and agricultural use, could cause human health problems: hydrocarbons, in fact, have been found by Acquedotto Pugliese in the already purified drinking waters. Particular attention must be put on monitoring the water quality of the reservoir in order to protect the health of surrounding populations, and an immediate safeguard action plan is extremely needed.

Assessment of heavy metals contamination in water and sediments of the Nile river, Jijel-Algeria

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Natural environment which is polluting by heavy elements is considered as a universal problem. The heavy metals released in the environment as the result of human activities, atmospheric depositions and erosions would finally enter in to the aqua systems. Since, heavy metals are toxic, stable in the environment and potential to combine with the nutritive continuum. Thus, they are considered as one of the most significant pollutant in aqua systems.

In order to evaluate the degree of metal contamination of sediments and surface waters of the River Nile and determine some physicochemical characteristics of the aquatic environment, water and sediment samples were collected and analyzed along the river from six stations during the year 2011-2012.

The main physicochemical results obtained show clearly a degradation of the quality of aquatic ecosystem studied and a metal contamination of water and sediments. This state of degradation exists in the upstream of the river and increased in the downstream.

The existence of high concentrations of heavy metals such as Pb (51.8-89.8ppm), Cd (35.27-50.35ppm), Zn (94.26-163.08ppm), Cu (97.23-121.69ppm) and organic elements such as NO_2 - (16.42-19.4mg / l) NO_3-(60.8-83.48mg / l) and PO_4-(27.76-36.87mg / l) indicates multiple origins of pollution which appears to be industrial, agricultural and / or urban, this may lead to an increase in the concentration of this medium by trace metals and other pollutants and thus lead to the ecotoxicological risks related to the nature of bioaccumulation of these elements.

Careful monitoring of the evolution of this pollution is a great need to save and protect this ecosystem to maintain its potential bioecological and improve the health status of the waterfront population.

Keywords: Nile River, Sediment, water, Heavy metals, Contamination, Physical Chemistry

MESAEP
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Biomonitoring of water quality Beni Haroun dam by use of biomarkers of stress in the species *Cyprinus carpio*

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The purpose of this study is to monitor the water quality of Beni Haroun dam. Thus, we conducted a follow-up of biochemical response to pollution using enzymatic biomarkers (catalase, glutathione-S-transferase) and non-enzymatic (lipid peroxidation, glutathione) of cytosolic oxidative stress in different tissues (liver branches and intestines) of *Cyprinus carpio*, chosen as bio-indicator, due to its ability to bioaccumulation and biomagnification of pollutants in its tissues. The results obtained in this study showed that this kind of fish is subject to oxidative stress. Its biochemical response was indicated by an increase of the enzymatic activity of catalase, and glutathione-s-transferase, a decreased in GSH level and then overproduction of MDA. The answer varies depending on the type of pollutant, tissue, age, size, and duration of exposure, which is considered as the life of the fish.

Keywords: Biomonitoring, water quality, oxidative stress, *Cyprinus carpio*, Beni- Haroun Dam

Experimental study of an anaerobic reactor with gas extraction piloted by computer

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In 2005, Moroccan government has adopted the national sanitation program, which recommended the using of extensive techniques for treatment of domestic wastewater such as the natural aerated lagoon system. This option is strategic by its simplicity, reliability and the fact that it doesn't require higher cost of investment and operation, which could well adapted in technical and financial terms by the local collectivities, without forgetting also wastewater reuse in irrigation.

Also, the first domestic wastewater treatment plants completed by the National Office of Electricity and Water were natural lagoon system. These stations have caused some objections from neighboring populations for odors generated by some of those plants.

It can be noticed for natural aerated lagoon system that odor's emission is the characteristic of anaerobic lagoons. But the enhancement of those emissions can be favored by the appearance of a malfunction or a combination of several hydraulic, organic and dimensional malfunctioning, and this is mainly encountered in transmission facilities, pumping and purification systems. Extreme hot periods of weather could also cause the amplification of this phenomenon.

To counteract the problem of emission of odor, various solutions have been proposed, including coverage of ponds and waste gas treatment. In this study, it has been proposed a new solution that has been studied in the laboratory. It consists to contain the gaseous emissions by a gas extraction system to 1) reduce odor and its environmental impact, 2) remove the gas discharge and to reduce the toxic effect of H2S towards the purifying bacteria (aerobic and anaerobic) and 3) to facilitate the purification process by biological means. This work was part of a national doctoral thesis which aims to study the anaerobic biological treatment using synthetic solutions containing glycerol in a batch reactor in low temperatures. The solution was seeded and purifying bacteria were recirculated by means of a computer-controlled to set the frequency of recirculation pump. During recirculation, the effluent flows over a conventional anaerobic biofilter. This allows to extract regularly, stripping the gases of fermentation (CO2, H2, CH4, H2S, etc..).

The first trials were carried out on synthetic solutions without sulfate to evaluate the kinetics of biological degradation in the absence of the toxic effect of H2S. A second series of tests were conducted in the presence of increasing doses of sulfate to highlight the impact of sulfate-reducing reaction kinetics and bacterial metabolism.

Despite low temperatures (average of 16.5 ° C) less than that required for mesophilic fermentation (35 ° C), the initial results were conclusive. The removing efficiency of the organic matter (initial COD concentration 900 mg / L) was 45%, 46% and 32% respectively for recirculation rate of 100%, 50% and 25%, after 20 hours. Whereas after 60 hours, it was found that the removing efficiency was 84%, 80% and 68% respectively for recirculation of 100%, 50% and 25%. Under the same conditions the reactor without recirculation doesn't give good result. These results allow us to treat the wastewater by an improved process with less odor production.

Keywords: Anaerobic, biofilter, extraction, odor nuisances, recirculation

Investigation of Adsorption Parameters Effects for Removal of Cyanide in Water by using Clinoptilolite

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The natural zeolite clinoptilolite is mined commercially a lot of areas in Turkey. In this study, the removal performance of clinoptilolite from Manisa-Gördes area for cyanide which are present in water has been investigated. Clinoptilolite were broken into pieces, and separated two particle size, -0.40/+0.32 mm and -0.71/+0.40 mm and the effect of 3 different initial cyanide concentrations and 3 different flow rates on cyanide removal capacity was tested. According to batch experimental results, approximately 60% cyanide removal from the water.

Keywords: Clinoptilolite, cyanide, removal, batch and dynamic system

Wastewater characterization of metal finishing industry

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Determination of wastewater characterization is one of the most important steps to evaluate the system and choose economic, eco-friendly wastewater treatment technologies. In this study, the wastewater sources of the metal finishing industry have been investigated and characterization studies have been performed. The metal finishing industry characterization studies is conducted in a factory located in Bolu, Turkey. Factory is working two shift a day. Domestic wastewater and industrial wastewater are two types of wastewater streams that come from the production process. The industrial wastewaters are treated by batch and continuous treatment plant, while domestic wastewater is treated by activated sludge system separately. There are three processes that produce wastewater which are surface pre-treatment, enamel and coating processes. In surface pre-treatment process; all sheet metal pieces coming from mechanical production or sub industry are cleaned and coated. This application, which is used to bring more thermal resistance, is inert surface coating technology. Stages of enamel process were schematized in Figure 1. There are also enamel coating stage, but wastewater is not produced at this stage. Thus, enamel coating stages have not been shared in this figure.

The part that are subject to surface treatment are drying, painting and cooking operations, consecutively. The painting process is varied by paint color or speciality. Silver process, white-black process and anti-finger process are in the painting process. Wastewater flows arriving to the wastewater treatment plant from black & white and anti-finger processes were shown in Figure 2.

There is also powder painting processs, but in powder coating process, the pieces that come from pre surface treatment process, are painted under dried condition. Wastewater production is not observed in this process in powder painting and drying oven. In addition to industrial wastewaters, domestic wastewater is produced by toilets, kitchens and laboratoies.

In the characterization studies, COD concentration of painting, enamel and rinsing wastewater were calculated as 60-265 mg COD/L, 220-615 mg COD/L and 55-155 mg COD/L, respectively. Especially, COD concentration in last three composite sample was between 220-280 mg COD/L while first grab sample was calculated as 615 mg COD/L. The variety of results showed that grab samples may also reflect particular situation in the production process. When first grab samples were taken, although production proceses were the same, COD concentration have shown variety. This result might be observed due to the day off in the production or discharging of painting and coating baths.

As a conclusion of characterization studies, when compared to the other raw wastewaters in the metal finishing sector, low pollution load was observed for the investigated industry. Between these processes, pollution load of enamel coating process is the most intensive one. In terms of heavy metal concentration, beside low concentration, a significant fluctuation in heavy metal concentration was not observed.

Keywords: Metal Finishing Industry, Characterization, Surface Coating Application, Wastewater Sources

A Decision support tool for choosing the most environmentally appropriate wastewater treatment option for small-scale communities by using LCA and AHP

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Wastewater treatment systems are designed and used to minimize adverse impacts of the wastewater on the environment before discharging. Various treatment options for wastewater treatment have been developed and each of them has different performance characteristics (e.g. material and land usage, energy consumption) and environmental effects (e.g. greenhouse gas emission, water and soil emission) on construction, operation or maintenance phases. Assessing environmental impacts of wastewater treatment systems, all effects occurring on these phases should be taken into account.

Treatment alternatives for wastewaters from agglomerations of more than 2000 PE are determined in EU Urban Waste Water Treatment Directive. However, the effluents of wastewater treatment plants which are discharged to sensitive areas from agglomerations of less than 2000 PE must receive "appropriate treatment". Appropriate treatment depends on the quality objectives of the receiving waters as well as the relevant provisions of the member states. Therefore, a decision support tool which can assess not only effluent quality, also all environmental effects occurring on construction, operation or maintenance phases of the treatment alternatives to help stakeholders is needed.

In this study, wastewater treatment options, such as vegetated land treatment (VLT), constructed wetlands (CW), rotating biological contactor (RBC), activated sludge treatment (AST), membrane bioreactor (MBR), and stabilization pond (SP) by which effluents are discharged to sensitive and less sensitive areas are evaluated by the life cycle assessment (LCA) approach. For this purpose, data related to energy usage, land requirement, raw material consumption, and released emissions from the life phases were collected with an inventory study and the environmental impacts were assessed by using SimaPro 7.1 LCA software. Because scale of the LCA results is global, an excel-based decision support tool that includes the LCA result is developed in order to meet local demands. Weight factors can be assigned on the LCA results according to local conditions by using Analytical Hierarchy Process and the most environmentally appropriate treatment option can be selected.

Keywords: Wastewater, Small-scale communities, Life Cycle Assessment, Analytical Hierarchy Process, Decision Support Systems.

Sulfate removal from indigo dying wastewaters by ettringite precipitation

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Sulfate is a common constituent of many natural waters and wastewaters and can cause various kinds of problems depending on its concentration and on the earth alkaline cation. Common examples include an altered taste of water, digestion troubles in animals and humans, soil acidification and corrosion of metals. Industrial wastewaters from paper mills, fertilizer production, pesticide production, aluminum anodizing and textile industries are responsible for the emissions of sulfate into the environment. The denim dying textile wastewaters are characterized by a dark blue color due to the presence of the dye not fixed to the fiber during the dyeing of the fabric. These wastewaters also contain significant concentrations of oxidized and non-oxidized sulfur species since in alkaline media in the presence of sodium dithionite ($Na_2S_2O_4$), the dye is converted to its reduced form, a leucoindigo, becoming soluble in water and exhibited chemical affinity with cellulose fiber. Compared with toxic metals, sulfate is only mildly hazardous however, considering the high concentrations typically found in some industrial effluents such as denim dying wastewaters, treating sulfate is a considerable task. Even though a number of methods exist for sulfate removal, such as precipitation with lime, precipitation with barium salts, co-precipitation with calcium carbonate, reverse osmosis and ion exchange, each of these has an inherent disadvantage. Ettringite precipitation process is considered to be an alternative sulfate removal technology. This process is based on the addition of aluminum hydroxide and lime at pH 11.5-12.0 resulting in precipitation of ettringite ($Ca_6Al_2(SO_4)_3(OH)_{12}\cdot26H_2O$). By employing ettringite precipitation, the sulfate ion levels can reduced to < 50 mg/L and aluminum hydroxide can also recovered and recycled. The purpose of this paper is to study the ettringite precipitation as an alternative treatment option for sulfate removal from indigo dying wastewaters. In the first step of the study, the conversion of reduced sulfur species by hydrogen peroxide (H_2O_2) oxidation and catalyzed air oxidation was experimentally evaluated. In the second step, ettringite precipitation was applied to oxidized wastewaters at reaction pH values between pH 11.0-12.5, which corresponded to the optimum pH for ettringite precipitation. Ettringite precipitation applied to H_2O_2 oxidized sample at pH 12.5 and at stoichiometric dose provided a reduction in sulfate concentration down to 2640 mg/L from 7040 mg/L (corresponding to 62% sulfate removal) whereas 75% sulfate removal was realized when the excess doses of calcium was applied in order to eliminate the interference of the alkalinity. The maximum sulfate removal efficiency for H_2O_2 oxidized sample was obtained at reaction pH of 11.3 as 86%. Ettringite precipitation applied to air oxidized sample provided up to 99.5% sulfate removal. Residual sulfate concentration around 20 mg/L was consistent with the literature results given for ettringite precipitation. The ettringite precipitation proved to be a promising treatment method for sulfate removal from indigo dying wastewater. The results of the present study were discussed and conclusions were drawn with focus not only on the sulfate removal efficiencies but also on the economics of the treatment process.

Keywords: Chemical precipitation, Ettringite, indigo dying wastewater, sulfate removal, textile industry

Water quality assessment and monitoring of pollution from unsanitary landfill: A Case Study Erzurum Narman

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The purpose of this study was examined the surface water quality assessment and monitoring of pollution affected by uncontrolled solid waste storage area in the Erzurum-Narman. In order to determine the dimensions of the water pollution selected the leachate and surface water samples were collected during the spring period in 2012 and 2013. For the sampling total 11 stations were selected, four of them around the main field, two of them the sources of water supply points, and last five away the sampling area at the Narman stream were pointed. Field work has been selected especially during the rainy periods. The renewability of water resources in the region was due to rainfall. Because of it was reduced by 23% in average rainfall in the sampling periods. Narman District, despite of the low density population, is so popular area for attractions in the Red Fairy Chimneys and geological importance. Not only with this feature, but also emphasis of the uncontrolled solid waste storage area close proximity to residential areas is very important in this study. The data obtained were analyzed, especially in terms of proximity to the main sources of the four station is referred to as encoding AK, in accordance with the Surface Water Quality Management Regulation, was determined IV grade water. In all the stations both the presence of dissolved elements, turbidity and color were observed. In the measured values in aquatic areas were remarkable reached the value of total phosphorus of 12 mg/L. Organic matter (COD) was determined in all stations IV. water quality class. According to Water Pollution Control Regulation Communiqué on Technical Methods, the maximum allowable concentrations of irrigation waters of heavy metals and toxic elements compared samples of copper (up to 0.2 mg / L) and chromium (up to 0.1 mg/L) were not suitable, AK1 station parameter in the analysis of zinc 4.88 mg / L was found to be very high value for irrigation water. Also chloride (2500 -3000 mg/L), fluoride (6 -7.5 mg/L), nitrate (15-635 mg/L) and sulfate (30 to 1315 mg/L) were determined parameters high concentrations. Despite increased monitoring and advances in detection methods, fecal pollution remains a persistent environmental challenge and a threat to public health. The ability to characterize and differentiate E. coli communities in a single fingerprint might not only facilitate the mitigation of fecal pollution, but also address the impact of environmental perturbations (i.e. pollution runoff, agricultural practices, land use changes) and seasonal, spatial and geographic variation on pathogen indicators. For this purpose, we were used as diagnostic marker to detect E coli with uidA gene in this study. The overall utility of DGGE analysis were measured by its ability to characterize E. coli communities contributing to a polluted environment.

Acute impact of benzo[a]anthracene on the utilization of simple substrate under aerobic conditions

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The study involved model evaluation of the acute impact of benzo[a]anthracene a significant compound among polycyclic aromatic hydrocarbons on the utilization of simple substrate by lower growing acclimated microbial cultures under aerobic conditions. Activated sludge taken from Paşaköy Municipal Wastewater Treatment Plant in Istanbul was acclimated to acetate. Acclimated biomass was obtained from a fill and draw reactor sustained at a sludge age of ten days, fed with acetate. Acute inhibition was tested in two parallel sets of batch reactors. Each reactor set was started with acclimated biomass seeding and pulse benzo[a]anthracene dosing, including a control reactor without benzo[a]anthracene addition. Model evaluation of the oxygen uptake rate, chemical oxygen demand and intracellular storage profiles indicated that benzo[a]anthracene did not affect microbial growth and storage. The noticeable acute impact was only observed with 44 mg/L of benzo[a]anthracene addition but it was limited with the storage mechanism: the amount organic substrate diverted to polyhydroxyalkanoates formation was significantly reduced. The overall COD removal efficiency was not affected.

Keywords: Acetate, acute impact, aerobic conditions, benzo[a]anthracene, oxygen uptake rate, polyhydroxyalkanoates

Evaluation of the toxicity of organic synthetic insecticide on the behavior of an alternative model of freshwater: *Paramecium aurelia*

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Many toxic substances generated by human activities are in daily discharged into the aquatic environment causing chronic pollutions mainly contributing to the deterioration of aquatic ecosystems. These substances foreign to living organisms (except some essential metals) or xenobiotics, contaminate all the compartments (sediment, column of water) and therefore many aquatic animal species.

In our work we describe the inhibitory effect of a synthetic phosphoramidate derivative at different concentrations (40, 60 and 80 µmol L-1) on alternative biological models in order to evaluate the impact at the cellular level.

The use of bio-indicator, the protozoan: *Paramecium aurelia*, characterized by a short life cycle, rapid multiplication and normal behavior that may be affected by the presence of pollutants. This aspect has led us to study the impact of an organophosphorus compound newly synthesized: PA-A on a pure culture of *Paramecium aurelia* during 72 hours.

We have demonstrated a dose-dependent inhibition of cell growth, confirming the cytotoxicity of xenobiotic tested. Stimulation of catalase and glutathione S-transferase activity known to be involved in the detoxification and what in the early hours of treatment. The increase in glutathione levels recorded in the presence of various PA-A concentrations, involve the activation of detoxification system.

Keywords: *Paramecium aurelia*, PA-A, Oxidative Stress, Detoxification

Pollution of Tigris River Sediment with heavy metals between Hammam Al-Alil and Samaraa/ North Iraq

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Thirty three samples of the recent sediment have been collected from The flood plain and the bottom of the Tigris River for the purpose of studying of heavy metals in the sediments to determine the concentration of some heavy metals in the river sediment. The following elements: Ni, Co, Zn, Fe, V, Pb, Li and Si have been determined in (ppm).Some of these elements within the standards while the others have higher concentration which considers pollutant elements. The richness of these elements may due to many reasons such as the industrial waste water of different plants, fertilizing materials used in agriculture and the gray water.

Keywords: Tigris River, sediment, heavy metal pollution, North Iraq

Using Industrial Waste Water for Constructing a Green Belt to Fix the Sand Dunes in Baiji area/North Iraq

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Desertification is an increasing problem in the Baiji area which is located north of Baghdad. The sand dunes in Baiji area causing many problems, such as accumulation of the moved sand on railways and roads, sand and dust storms which affect and causes pollution for civil constructions and industries in the area, as well as, increasing desertification.

During the last twenty years most seasons were dry and the annual average of rainfall has been minimal. The study aims to threw light of the climatologically change and their effect on plant cover and agriculture in the area.

The sand dunes and the sand sheets have been sampled and climatological elements such as the direction of wind and temperature during the last few years has been collected from many references. Objectives of the research is to study the development and extension of sand dunes and sand sheets during the last 50 years, and the different parameters of this study leads to plan to construct a green belt by using the available waste water and ground water that help in limiting the desertification in the area which is happening due to the climate changes.

Keywords: Desertification, green belt, Baiji area, sand dunes, industrial waste water

Modeling and optimization of biological treatment in the design of a wastewater treatment activated sludge

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The aeration basin or aerated biological reactor is a major component of activated sludge treatment plant. Operation affects the quality of treatment, sludge industry and energy expenditure. The knowledge of the hydrodynamics of these reactors is a key issue to improve their design and thus to optimize their operation. Our study focuses on the use of code FLUENT calculation for the simulation of flow in aeration tanks where the wastewater treatment plant Souk Ahras, where the functions of aeration and mixing are separated. This software uses the finite volume method to solve the Navier-Stokes turbulent regime. The ultimate goal lies in the definition of technical measures to improve the operation of the facility.
Finally, we highlight the influence of aeration on traffic speeds and the phenomena of upward convection of water (spring flows), which causes a decrease in the oxygen transfer in the basin. The impact of horizontal velocity on certain types of spiralflows is studied. Large spiral flows completely disappear from a speed of 0.3 ms-1. These simulations are done for different geometries basins.

Keywords: channel oxidation Fluent, hydrodynamics, oxygen transfer, agitation