2013

Environment Abstracts

Eighth Annual International Conference on Environment 13-16 May 2013, Athens, Greece

Edited by Gregory T. Papanikos

THE ATHENS INSTITUTE FOR EDUCATION AND RESEARCH

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8th Annual International Symposium on Environment 13-16 May 2013, Athens, Greece

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Preface

This abstract book includes all the abstracts of the papers presented at the 8*th Annual International Symposium on Environment, 13-16 May 2013,* organized by the Athens Institute for Education and Research. In total there were 38 papers and 38 presenters, coming from 30 different countries (Albania, Algeria, Austria, Brazil, Bulgaria, Canda, China, France, Hong Kong, India, Iran, Iraq, Israel, Italy, Jordan, Lithuania, Malaysia, Morocco, Poland, Saudi Arabia, Serbia, Singapore, Slovenia, South Korea, Sweden, Taiwan, Thailand, Turkey, UK, USA). The conference was organized into 10 sessions that included areas of Energy Optimization, Water Management, Environment, Sustainable Development, Optimization of Resources and other related fields. As it is the publication policy of the Institute, the papers presented in this conference will be considered for publication in one of the books of ATINER.

The Institute was established in 1995 as an independent academic organization with the mission to become a forum where academics and researchers from all over the world could meet in Athens and exchange ideas on their research and consider the future developments of their fields of study. Our mission is to make ATHENS a place where academics and researchers from all over the world meet to discuss the developments of their discipline and present their work. To serve this purpose, conferences are organized along the lines of well established and well defined scientific disciplines. In addition, interdisciplinary conferences are also organized because they serve the mission statement of the Institute. Since 1995, ATINER has organized more than 150 international conferences and has published over 100 books. Academically, the Institute is organized into four research divisions and nineteen research units. Each research unit organizes at least one annual conference and undertakes various small and large research projects.

I would like to thank all the participants, the members of the organizing and academic committee and most importantly the administration staff of ATINER for putting this conference together.

Gregory T. Papanikos
President

FINAL CONFERENCE PROGRAM

8th Annual International Symposium on Environment, 13-16 May 2013, Athens, Greece

PROGRAM

Conference Venue: **St George Lycabettus, 2 Kleomenous Street, 106 75 Kolonaki, Athens, Greece**

ORGANIZING AND SCIENTIFIC COMMITTEE

1. Dr. Gregory T. Papanikos, President, ATINER.
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12. Dr. Romana Elzbieta Pawlinska-Chmara, Assistant Professor, Opole University, Poland.
13. Dr. Nyuk-Min Chong, Professor, Da-Yeh University, Taiwan
14. Dr. Salazar Raquel, Professor-Researcher, Universidad Autónoma Chapingo, Mexico.
15. Dr. Jovan Babovic, Professor, University Business Academy, Serbia.
16. Dr. Amit Sarin, Associate Professor, Amritsar College of Engineering and Technology, India.
17. Dr. Abdul Jamil Urfi, Associate Professor, Delhi University. India.
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20. Dr. Matthew Kubik, Associate Professor, Indiana University, USA.
21. Dr. Ja'afar-Furo Muhammad, Lecturer, Adamawa State University, MUBI, Nigeria.
22. Dr. Hussain Naser, Director, Kufa University, Iraq.
23. Ms. Rouska Bozkova, Ph.D. Student, South West University Neofit Rilski, Bulgaria.
24. Mrs. Anna Tsireme, Ph.D. Student, Jaume I, Castellon, Spain.
25. Ms. Eirini-Renata Dimitrokali, Ph.D. Student, University of Central Lancashire, U.K.
26. Mr. Fadi Al Jallad, Researcher, National Energy and Water Research Center, UAE.
27. Dr. Arturo F. Castellanos-Ruelas, Autonomous U. Yucatan, Mexico.
28. Dr. Omar Muthanna, Abu Dhabi Water and Electricity Authority, UAE.
29. Dr. Nirit Bernstein, Research Scientist, Volcani Research Center, Israel.
30. Mr. Mehran Narimisa, Academic - Don, Azad University, Iran.
31. Mr. Vlasios Oikonomou, Researcher, University of Groningen, the Netherlands.
32. Ms. Lila Skountridaki, Researcher, ATINER & Ph.D. Student, University of Strathclyde, U.K.
33. Mr. Vasilis Charalampopoulos, Researcher, ATINER & Ph.D. Student, University of Strathclyde, U.K.

Administration

Fani Balaska, Stavroula Kiritsi, Eirini Lentzou, Konstantinos Manolidis, Katerina Maraki & Celia Sakka

C O N F E R E N C E P R O G R A M

(The time for each session includes at least 10 minutes coffee break)

Monday 13 May 2013

08:00-08:30 Registration

08:30-09:00 Welcome and Opening Remarks

- Dr. Gregory T. Papanikos, President, ATINER.
- Dr. George Poulos, Vice-President of Research, ATINER & Emeritus Professor, University of South Africa, South Africa.

09:00-10:30 Session I: Environmental Management & Sustainable Urban Development I

Chair: George Poulos, Vice-President of Research, ATINER & Emeritus Professor, University of South Africa, South Africa.

1. *Terence Centner, Professor, University of Georgia, USA. Evaluating the Oversight of Shale Gas Production for Ideas to Manage Risks.
2. Abdel Ghaly, Professor, Dalhousie University, Canada. An Innovative Approach to Managing Industrial Parks and Closed Landfills.
3. Shahrzad Faryadi, Associate Professor, University of Tehran, Iran & Nasim Sharifianpur, M.Sc. Student, University of Tehran, Iran. Evaluating the Quality of Socio-Economic Features in Isfahan's Urban Environment.
4. Sigita Svediene, Head of the Environmental Treatment Laboratory, Vilnius' Municipal Private Limited Company "Grinda", Lithuanian Republic, Algimantas Vilunas, Director, Vilnius' Municipal Private Limited Company "Grinda", Lithuanian Republic & Rimantas Kupliauskas, Head of Vilnius' Rainwater Runoff System Exploit Department Vilnius' Municipal Private Limited Company "Grinda", Lithuanian Republic. The Management of Vilnius' Rainwater Runoff System: Achievements, Problems, Prospects.
5. Vera Arezina, Assistant Professor, University of Belgrade, Serbia. Education for Sustainability.

10:30-12:00 Session II: Pollutants and Pollution

Chair: *Terence Centner, Professor, University of Georgia, USA.

1. Nicolai Mirlean, Professor, Federal University of Rio Gande, Brazil. The Distinctive Impact of Copper-Based Fungicide Application in Brazilian Wet Subtropics.
2. Alexia Aldrian, PhD Student, Chair of Waste Processing Technology and Waste Management, Department of Environmental and Energy Process Engineering, Montanuniversitaet Leoben Austria, Renato Sarc, Professor, Department of Environmental and Energy Process Engineering, Montanuniversitaet Leoben, Austria, Patrycja Czyzykiewicz, Professor, Department of Environmental and Energy Process Engineering, Montanuniversitaet Leoben, Austria & Roland Pomberger, Professor, Department of Environmental and Energy Process Engineering, Montanuniversitaet Leoben , Austria. Assessments of the Mobility of Chromium in a Quality Assured Electric Arc Furnace Slag.
3. Marina Beatriz Agostini Vasconcellos, Scientific Researcher, IPEN/CNEN-SP, Brazil, N. M. Ishikawa, Instituto de Pesca de SP, São Paulo, Brazil, M. J. T. R. de Paiva, Instituto de Pesca de SP, São Paulo, Brazil, J. V. Lombardi, Instituto de Pesca de SP, São Paulo, Brazil, E. G. Moreira, IPEN/CNEN-SP, Brazil & M. G. M. Catharino, IPEN/CNEN-SP, Brazil. Study of methylmercury biomagnificationww in Wistar rats(Rattus novergicus) fed with methylmercury contaminated Tilapia (Oreochromis niloticus).

12:00-13:00 Session III: Environmental Quality – Water and Air
Chair: Vera Arezina, Assistant Professor, University of Belgrade, Serbia.

1. Yuk-Shan Wong, Vice-President & Professor, Hong Kong University, China & Nora Fung-Yee Tam, Professor, City University of Hong Kong, China. Polybrominated Diphenyl Ethers in Wastewater Treatment Plants and Their Removal.
2. Christos Christodoulatos, Professor and Associate Provost, Stevens Institute of Technology, USA, Washington Braida, Associate Professor, Stevens Institute of Technology, USA, Julius Pavlov, Graduate Research Assistant, Stevens Institute of Technology, USA, Elsie Kitcher, Graduate Research Assistant, Stevens Institute of Technology, USA, Tsang-Liang Su, Research Associate Professor, Stevens Institute of Technology, USA, Agamemnon Koutsospyros, Professor, University of New Haven, USA, Benjamin Smolinski, Engineer, RDECOM-ARDEC Picatinny Arsenal, USA. Reductive Degradation of NTO and DNAN in Industrial Wastewater Effluents by Fe/Cu Bi-metal Treatment.
3. Sanjay Mukherjee, Researcher, University of Surrey, UK, Prashant Kumar, Professor, University of Surrey, UK & Ali Hosseini, Professor, University of Surrey, UK. Chemical Looping Combustion of Coal for CO2 Capture: Process Simulation and Optimisation using Aspen Plus.

13:00-14:00 Lunch (details during registration)

14:00-15:30 Session IV: Materials for the Environment
Chair: Washington Braida, Associate Professor, Stevens Institute of Technology, USA

1. Mohammaed Abu-Dieyeh, Associate Professor, The Hashemite University, Jordan. Sclerotinia Minor, a Successful Biocontrol Agent for Broadleaf Weeds in Turfgrass Systems.
2. Iwona Lupul, PhD Student, Wrocław University of Technology, Poland, Grażyna Gryglewicz, Professor, Wrocław University of Technology, Poland, Jan Yperman, Professor, Hasselt University, Belgium and Robert Carleer, Professor, Hasselt University, Belgium. Development of Porosity of Hemp Stem-Based Activated Carbon Produced by Phosphoric Acid Activation in Steam and Nitrogen Atmosphere.
3. Fares Alsewailem, Associate Professor, King Abdulaziz City for Science and Technology (KACST), Saudi Arabia & Saad A Aljlil, King Abdulaziz City for Science and Technology (KACST), Saudi Arabia. Adsorption of Cu & Ni on Bentonite Clay from Waste Water.

15:30-17:00 Session V: Nature and Natural Resources
Chair: Kafia Surchi, Assistant Professor, Iraq.

1. Harnpon Phungrassami, Assistant Professor, Thammasat University, Thailand. Carbon Footprint of Straw Mushroom: A Case Study in Thailand.
2. Chan Lee, Professor, University of Suwon, South Korea, Bong Jin Jung, Jin Wook Lee & Yongseung Yun. CFD Analyses on the Entrained-bed Coal Gasifier of Korean IGCC Test-bed Facility.
3. Nadir Ayrilmis, Associate Professor, Istanbul University, Turkey & Emrah Ergul, Kastamonu Integrated Wood Company, Turkey. Effect of Outdoor Storage of Wood Chip Pile on the Physical and Mechanical Properties of High Density Fiberboard.
4. Myriam Robert, Fellow Researcher, UMR AMURE, France & Bertrand Le Gallic, Assistant Professor, UMR AMURE, France. Assessing the Economic Value of a Fishing Fleet.

17:00-18:30 Session VI: Environmental Management & Sustainable Urban Development II
Chair: Harnpon Phungrassami, Assistant Professor, Thammasat University, Thailand

1. Vincent Wai-Kit Ho, Assistant Professor, University of Macau, China. Paradox of Coupling World Cultural Heritage Site and Casinos: Dilemma of Macau's Tourist Industry and the Reshaping of the Urban Environment.
2. Zeittey Karmilla Kaman, Lecturer, University Tenaga National, Malaysia, Zaleha Othman, Senior Lecturer, University Utara Malaysia, Malaysia & Salina Daud, Deputy Dean, University Tenaga National, Malaysia. Incorporating a 'Friendly Environmental Csr Model' for Sustaining Future Dimension: Needs and Demand.
3. Katarina Ana Lestan, PhD Researcher, Urban Planning Institute of the Republic of Slovenia, Slovenia, Golobic Mojca & Golicnik Barbara. The Role of Urban Green Areas for Quality of Life.
4. Bertrand Le Gallic, Assistant Professor, UMR AMURE, France. Valuating Marine Living Resources: Effects of Technological, Marketing and Management Choices.

21:00–23:00 Greek Night (Details during registration)
Tuesday 14 May 2013

08:00-10:00 Session VII: Environmental Technology
Chair: *Nirit Bernstein, Research Scientist, Volcani Research Center, Israel.

1. Partheeban Pachaivannan, Professor and Dean, St. Peter's College of Engineering and Technology, India, H. Prasad Raju, Associate Professor, St. Peter's College of Engineering and Technology, India & R. Rani Hemamalini, Professor and Head, Department of Electronics and Communication Engineering, St. Peter's College of Engineering and Technology, India. Air Pollution Monitoring Using GIS, GPS and Gas Sensors for Chennai City.
2. *Aline Ramos da Silva, PhD Student, University of Sao Paulo, Brazil, Debora do Carmo Linhares, Rita de Cassia Paro Alli, Patricia Leo, Elda Sabino da Silva & Maria Filomena de Andrade Rodrigues. Biodegradation of Hexachlorocyclohexane in Solid and Slurry Phases. (Tuesday 14 May 2013)
3. Nawel Boucherba, Professor, University of Bejaia, Algeria, Said Benallaoua, Professor, University of Bejaia, Algeria & Azedine Bettache, Professor, University of Bejaia, Algeria. Extraction of Jonesia Denitrificans Xylanases by Aqueous Two Phase System.
4. Hristo Kolev, Assistant Professor, Bulgarian Academy of Sciences, Bulgaria, Silviya Todorova, Associate Professor, Bulgarian Academy of Sciences, Bulgaria, Anton Naydenov, Associate Professor, Bulgarian Academy of Sciences, Bulgaria, Georgi Ivanov, Bulgarian Academy of Sciences, Bulgaria, Ramona Ene, Researcher, Institute of Physical Chemistry, Romania, Viorica Parvulescu, Researcher I, Institute of Physical Chemistry, Romania, Georgi Kadinov, Associate Professor, Bulgarian Academy of Sciences, Bulgaria. Catalytic Activity of Mesoporous SBA-15 Modified with Pt and Ti in a Deep Methane, *N*-Hexane and CO Oxidation.
5. *Kafia Surchi, Assistant Professor, Iraq & Huda Yousif Shareef. Removal of Cu, Ni and Zn from Polluted Water by Agricultural Wastes.

10:00-12:00 Session VIII: Recycling, Sustainability and Green Technology
Chair: Dr. Bruria Heuer, Senior Scientist, ARO Volcani Center, Israel.

1. Zygmunt Kowalski, Professor and Dean of Chemical Engineering Faculty, Cracow University of Technology, Poland & Agnieszka Makara, Assistant Professor, Cracow University of Technology, Poland, Józef Hoffmann, Professor, Wrocław University of Technology, Poland & Krystyna Hoffmann, Assistant professor, Wrocław University of Technology, Poland. Processing of the Pig Manure into Solid Multicomponent Mineral – Organic Fertilizers.

2. John Sansalone, Professor, Engineering School of Sustainable Infrastructure and Environment, USA. Urban Drainage Treatment Sustainability: Measurements and Models.
3. *Nirit Bernstein, Research Scientist, Volcani Research Center, Israel. Environmental and Health Implications of Utilization of Treated Wastewater for Agricultural Irrigation.
4. Annarita Attianese, Graduate Student, Second University of Naples, Italy. Microcredit and Green Economy.
5. *Chengcheng Hu, Ph.D. Student, Nanyang Technological University, Singapore, Apostolos Giannis, Research Fellow, Nanyang Technological University, Singapore, Jing-Yuan Wang, Director, Nanyang Technological University, Singapore & Chia Lung Chen, Research Fellow, Nanyang Technological University, Singapore. Biohydrogen Production from Renewable Resources by Fermentatvie Bacteria.
6. Ting Liu, PhD Student, Nanyang Technological University, Singapore. Engineering Shewanella Biofilm for Enhanced Electricity Output in Microbial Fuel Cells.

12:00-13:00 Lunch (Details during registration)

13:00-14:30 Session IX: Climate Change, Energy and Biofuel I
Chair: *Chengcheng Hu, Ph.D. Student, Nanyang Technological University, Singapore

1. Genco Silvia, Researcher, ISAC-CNR - Institute of Atmospheric Sciences and Climate, Italy, Daniele Bortoli, Evora University, Portugal & Fabrizio Ravegnani, Researcher, ISAC-CNR - Institute of Atmospheric Sciences and Climate, Italy. Monitoring the Antarctic Stratosphere after the Montreal Protocol.
2. Ping Wang, Researcher, Virginia Institute of Marine Science, USA, Harry Wang, Researcher, Virginia Institute of Marine Science, USA & Lewis Linker, Researcher, Virginia Institute of Marine Science, USA. Assessment of Hypoxia and its Relationship with Nutrient Loads and Wind, and Implication in the Chesapeake Bay Management.
3. Fabiana Barbi, Ph.D. Student, State University of Campinas, Brazil & Leila Da Costa Ferreira, Professor, State University of Campinas, Brazil. Climate Change Policy at Subnational Government Level in Brazil: Risks and Political Strategies.

14:30-15:30 Session X: Climate Change, Energy and Biofuel II
Chair: *Aline Ramos da Silva, PhD Student, University of Sao Paulo, Brazil

1. Therese Asplund, Ph.D. Student, Linkoping University, Sweden. To be or not to be? Swedish Farmers' Perceptions of Climate Change.
2. Nyuk-Min Chong, Professor, DaYeh University, Taiwan, Shih-Tsung Yu, Associate Professor, DaYeh University, Taiwan & Thi Huyen Nhung Dao, Student, DaYeh University, Taiwan. Effects of Sodium Bicarbonate Concentration on Biomass Growth of Algae Nanochloropsis Sp.

17:30-20:30 Urban Walk (Details during registration)
21:00-22:00 Dinner (Details during registration)
Wednesday 15 May 2013
Cruise: (Details during registration)
Thursday 16 May 2013
Delphi Visit: (Details during registration)

Mohammaed Abu-Dieyeh
Associate Professor, The Hashemite University, Jordan

Sclerotinia Minor, a Successful Biocontrol Agent for Broadleaf Weeds in Turfgrass Systems

Control of *Taraxacum officinale* (dandelion) and other broadleaf weeds in turfgrass has been readily achieved with phenoxy herbicides, but the herbicide option has been revoked in many regions, necessitating alternative weed control strategies. One biological alternative is *Sclerotinia minor*, an ascomycete fungus. The goal of this study was to understand biotic and abiotic interactions and to maximize effectiveness of a *S. minor* formulation as a biocontrol agent using an ecological approach. A three year field study showed that *S. minor* was similarly efficacious to herbicide application. 13 worldwide dandelion accessions and 32 broadleaf species were susceptible to *S. minor*. Biocontrol efficacy was inversely correlated with dandelion age, but efficacy on all ages was enhanced in the presence of grass competition. When the bioherbicide-treated-plots were covered with burlap fabric for three days, broadleaf weed control was greatly enhanced. The cover was made of natural jute fibres that retains water, and with a degree of transparency, allows some light through the fabric for the grass. Virulence of the bioherbicide was maintained even under elevated temperatures. During the hot summer season, application of 40 g m^{-2} of *S. minor* bioherbicide was not effective, but when covered with jute, dandelion density and broadleaf weed ground cover were significantly reduced. 3-5 days of cover did not weaken, damage, or incite any disease symptoms on the turfgrass. This covering approach may overcome many of the obstacles that prevent commercialization of many bioherbicides and broaden the use of the *S. minor* bioherbicide, under less than optimum environmental conditions.

Alexia Aldrian
PhD Student, Chair of Waste Processing Technology and Waste Management, Department of Environmental and Energy Process Engineering, Montanuniversitaet Leoben Austria
Renato Sarc
Professor, Chair of Waste Processing Technology and Waste Management, Department of Environmental and Energy Process Engineering, Montanuniversitaet Leoben, Austria
Patrycja Czyzykiewicz
Professor, Chair of Waste Processing Technology and Waste Management, Department of Environmental and Energy Process Engineering, Montanuniversitaet Leoben, Austria
&
Roland Pomberger
Professor, Chair of Waste Processing Technology and Waste Management, Department of Environmental and Energy Process Engineering, Montanuniversitaet Leoben , Austria

Assessments of the Mobility of Chromium in a Quality Assured Electric Arc Furnace Slag

Electric arc furnace slags are suitable construction and paving materials for roads due to their physical properties (e.g. volume stability). However, concerns are raised in regards to the leaching behaviour of the slags, especially in regards to the element chromium and its toxicity in the hexavalent state. The leaching behaviour is significantly controlled by the mineral phases and their solubility. The formation of mineral phases depends mainly on the process conditions (i.a. additives, temperature, cooling rate). In this contribution, the content, the element distribution and the mobility of chromium in an electric arc furnace slag were investigated and assessed.

The material analyzed was a slag from steel producer in Austria using an electric arc furnace, where unalloyed scrap is used as raw material. XRF analysis and examination with an electron microprobe were carried out as well as leaching tests with initial acid/base addition to influence the pH.

The XRF results gave a total chromium content of 1.68 % (w/w). The mineralogical investigation with the electron microprobe showed that chromium ions are bound within stable spinel phases.

Two different types of spinels occur in the slag: aluminium-chromium-magnesium- and chromium containing aluminium-magnesium-spinels (type 1) as well as chromium-manganese-iron-spinels (type 2). The chromium content in the accompanying phases

(i.a. gehlenite) is insignificant. The natural occurrence of the two mentioned spinel types is quite common and they are found in several mountain masses in Styria. In rivers close by, sedimentary accumulation of chromium rich spinels can be found as well. Therefore, the leaching of spinel bound chromium of this electric furnace slag is unlikely, which was also confirmed by the results of the performed leaching tests.

So far, the occurrence of the natural spinels has not resulted in any known environmental problems.

Fares Alsewailem
Associate Professor, King Abdulaziz City for Science and Technology (KACST), Saudi Arabia
Saad A Aljlil
King Abdulaziz City for Science and Technology (KACST), Saudi Arabia

Adsorption of Cu & Ni on Bentonite Clay from Waste Water

A local bentonite clay from Jeddah, Saudi Arabia was characterized and tested for its ability to adsorb copper (Cu) and nickel (Ni) from wastewater. The clay material was characterized by x-ray diffraction (XRD), surface area and pore size (BET), and x-ray fluorescence (XRF). Besides, the local clay was tested for metal ions adsorption without pretreatment under different temperature regimes. It was found that the adsorption capacity of bentonite clay increased with an increase in the experimental temperature. The maximum adsorption capacity was 13.22 mg g^{-1} for copper (Cu) at 20 ^{o}C. For nickel (Ni) ions, the maximum capacity was 9.29 mg g^{-1} at 20 ^{o}C. A comparison among all the isotherm models at different temperatures described the experimental data well.

Vera Arezina
Assistant Professor, University of Belgrade, Serbia

Education for Sustainability

The aim of this paper is to underline the role of education regarding water, energy and pollution policy, energy efficiency, indicators of sustainability and other issues. Education has important role in non-EU countries, such as Serbia due to accesion to EU and implementation of EU policies. On the other hand, sustainability is balancing three pillars – environment, social and economic on national or regional level. But, the prerequisite for meeting the sustainability is education as factor of development of human capital, able to respond and adapt to evolving needs of our society due to climate changes and economic crises in the world. In many countries, in Serbia as well, more and more institutions are trying to embed sustainability in their academic programs, courses and teachin materials. One may say that the global call to action for mainstreaming sustainability has begun across the educational system. At the same time, industry has to adapt to renewable resources due to increasing scarcity and energy challanges. Education, based on the principles of sustainability is not a choice, but only option. As the result of many above mentioned challenges is the demand for green human capital in the world.

Therese Asplund
Ph.D. Student, Linkoping University, Sweden

To be or not to be? Swedish Farmers' Perceptions of Climate Change

The focus of climate change has shifted from being predominantly a physical phenomenon to being simultaneously a social phenomenon, moving from the scientific field to the field of international, regional and national politics to being realized as an issue in the need of action from such variety of stakeholders as the businesses, various sectors and individuals (Hulme, 2009). While addressing such heterogeneous groups requires an understanding of the context specific, previous research on communicative aspects of climate change has been dominated by studying the general public perceptions and mainstream media representations. There is now call for more case-specific and audience-specific research (Moser, 2010; Whitmarsh and Lorenzoni, 2010).

This presentation highlights Swedish farmers´ perceptions of climate change. Agriculture differs in many respects from the general public. Both as farmers are more likely to observe and notice subtle environmental changes (Moser, 2010) and as farmers historically have shown high level of adaptability to climate variations (Easterling et al., 2007). These well-known skills and experiences are assumed to have important implication for the communication of climate change information to farmers (Hansen, Marx and Weber, 2004)

The aim with this study is twofold and oriented towards content and process:

- How is climate change understood by farmers?
- How do farmers shape their perceptions of climate change?

Through focus group discussions with Swedish farmers, this study finds that 1) climate change is often understood as a natural process with little or no human influence, 2) an underlying assumption following the 'naturalness' of climate change is that responses to climate change are not needed, 3) farmers relate and understand climate change through own experiences.

The presentation will end with a discussion on audience-specific framings of climate change to various social and cultural groupings.

Annarita Attianese
Graduate Student, Second University of Naples, Italy

Microcredit and Green Economy

Several clues show that there is an high chance that in few years our globe would not look like the same as it is today. Obviously it is not a problem which affects who's living on the earth right away, but what about future generation? The all over know Millennium Development Goals already tried , in a very shy way, to convince the world's leaders to invert the degenerative route within 2015. Unfortunately the 2015 is behind the corner and all "good proposals" are about to fail. In the very short period the earth will probably still host poor and hungry people not universally educated and still affected by few gender equity. Among these, more we will find unhealthy moms and children, and most of them will be fighting against sexually transmitted diseases. And, at the end of the "wish list", we can read some concerns about both environmental sustainability and global partnership.

Would be so revolutionary beginning this list from the bottom? What about starting talking circa global partnership and environmental sustainability at first?

The global partnership states the necessity to share and work in a cooperative way in order to seek the one and unique purpose, which is human wellness. And that is, indeed, the ground where start building.

Rather, the idea of environment, it's far to be only related most on biological and natural surroundings of an human being, as many could believe. The idea I've been working on, handles mostly about how the environment concept has not to be confined only in everything concerns nature preservation or pollution decrease or, still, green politics. But it regularly must to deal with economics, law and behaviours in order to globally change frame of mind so as to reach world wellness goals for us and future generations. With no earth to live on, either there will be no longer human being concern.

Can some economic green project really provide an equally gendered job, assuring food, improving human health and, at the same time, truly preserve environment? Yes, it can. Projects offer job opportunities which assure food and money; this will guarantee access to medicines and education; moreover the world green means that they are environmentally suited.

Still, does exist some financial budget able to guarantee a widespread availability for these projects even if they are addressed to poor, unoccupied and not educated people and, consequently, can not immediately represent an high income capital expenditure? This is how microcredit makes an entrance.

Nadir Ayrilmis[1]
Associate Professor, Istanbul University, Turkey
&
Emrah Ergul
Kastamonu Integrated Wood Company, Turkey

Effect of Outdoor Storage of Wood Chip Pile on the Physical and Mechanical Properties of High Density Fiberboard

Effect of outdoor storage of wood chip pile on the physical and mechanical properties of high density fiberboard (HDF) was investigated in this study. The pine chip pile was stored outdoor for up to 6 months at woodyard of a commercial mill. The HDFs with dimensions of 2445 mm x 2200 mm x 8 mm were produced from the chips with dimensions of of 22-25 mm x 19-20 mm x 4-5 mm at 15, 30, 45, 60, 90, 120, and 180 days of the storage at Kastamonu Integrated Wood Company, Gebze, Turkey. Some physical such as density, moisture content, and thickness swelling (TS, 24 hours) and mechanical properties such as flexural strength (MOR), flexural modulus (MOE) and internal bond strength (IB), and formaldehyde emission (perforator method) of the boards were determined according to EN standards. In general, the TS of the boards increased linearly as the storage time increased from 15 to 180 days. The MOR values decreased noticeably after 60 days of the chip storage while this decrement was observed for the MOE values after 90 days. The formaldehyde emission values of the boards increased from 8.0 to 9.6 mg/100g. The IB values of the control boards significantly decreased (1.7 to 1.1 MPa) as the storage duration reached to 180 days. In particular, the IB values decreased noticeably beyond 60 days. Based on the findings obtained from the present study, it can be said that storage duration of pine chip piles used in the HDF production should not be more than 60 days.

[1]This study was prepared from Master Thesis of Emrah Ergul

Fabiana Barbi
Ph.D. Student, State University of Campinas, Brazil
&
Leila Da Costa Ferreira
Professor, State University of Campinas, Brazil

Climate Change Policy at Subnational Government Level in Brazil: Risks and Political Strategies

In terms of responses to risks posed by climate change, it has been argued that governments are important actors that play a key role setting regulations, institutions and appropriate modes of governance in order to address these risks at different levels and scales. This paper analyses how Brazilian cities and states are responding to climate change in terms of policy strategies and instruments. Cities and states with specific legislation to address the climate issue were surveyed through searches on some Brazilian key websites. Afterwards, the following characteristics related to climate governance were analyzed in these policies:

1. climate change mitigation: goals to reduce greenhouse gases (GHG) emissions;
2. adaptation to climate change impacts;
3. multi-sectoriality in the implementation of the law by different government sub-sectors related to the climate issue;
4. articulation among different actors: presence of institutional structures that include the participation of different segments of society;
5. government participation in transnational networks related to climate change.

Our findings showed that only five cities and eleven Brazilian states have specific legislation related to climate change. Most of these laws had its approval since 2009, at which point the issue of climate change was among the first ones in the political agendas in the world, prior to the Conference of the Parties - COP 15, in Copenhagen. Out of the 16 subnational laws, only 9 count on both mitigation and adaptation actions. Most laws have multi-sectorial nature of implementation, an important factor considering the climate issue that is related to different sectors of government action. Half of the cities and states with laws participate in transnational cooperation networks linked to climate change. These Brazilian subnational policies are isolated initiatives in the national context; however they are important actions in combating climate change in the country.

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Environmental and Health Implications of Utilization of Treated Wastewater for Agricultural Irrigation

The use of treated urban wastewater for irrigation in modern agricultural is steadily increasing world-wide and due to shortages of fresh water is common today in many regions throughout the world. Utilization of this water source for irrigation in the production fields is an environmentally sustainable approach, which incorporates the advantage of minimizing the disposal to the environment. Furthermore, irrigation with treated wastewater incorporate benefits to agricultural by reducing demands for fertilizers inputs as a result of the higher concentrations of macronutrients in this water. At the same time, inhibiting effects on the irrigated crops may source from the higher concentrations of salts, bicarbonate, boron, heavy metals, and pH level present in the treated wastewater. The use of treated wastewater for agricultural irrigation may result in human exposure to pathogens, creating potential public health problems. Although the concentration of human pathogens decrease during the wastewater reclamation process, the secondary treated effluents most commonly used for irrigation today still contain bacterial human pathogens. National and global regulations were developed and are applied to facilitate optimal and safe production under irrigation with treated wastewater.

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Extraction of *Jonesia denitrificans* xylanases by Aqueous Two Phase System

Interest in xylanases from different sources has increased markedly in the past decade, in part because of the application of these enzymes in the pulp and paper industry. The extensive use of enzymes in industrial applications necessitates the development of efficient and economical methods for their large-scale separation, concentration and purification from the raw extract, since the most expensive part of biomolecule production is recovery and purification.

An attractive and a simple method for protein separation is the utilization of an aqueous two phase system (ATPS) providing a mild environment for sensitive biopolymers like proteins, easy scale-up, short process time, high enzyme recovery, low capital and operating costs.

When we use orange peel as substrate in the fermentation medium, the ATPS composed of 3,5% PEG 4000 and 14% potassium phosphate - 9% KI was favorable for partition of *Jonesia denitrificans* xylanases which always partitioned to the top phase. Basic pH, low PEG concentration, salt addition, and presence of microbial cells enhanced xylanase partitioning. 80% xylanase recovery was obtained; activity staining results verified partitioning of xylanases to the top phase.

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Evaluating the Oversight of Shale Gas Production for Ideas to Manage Risks

The United States has rapidly expanded its natural gas production from deep shale gas reserves through the use of hydraulic fracturing. An estimated 11,000 new wells are fractured each year and another 1,400 are re-fractured. Due to exceptions in various US federal laws, fracturing activities are being conducted with little federal oversight. Furthermore, because legislators are anxious to achieve greater domestic energy production and temporary financial gains, the regulations may not do enough to encourage safety and the adoption of technology and processes that could minimize risks and damages. Environmental groups contend that hydraulic fracturing and shale gas production are foisting damages on neighbors, communities, and future generations.

The absence of sufficient federal oversight of shale gas production has led individual US state governments to take an active role in overseeing fracturing operations. Fears that use of toxic chemicals in fracturing wells may be accompanied by releases that harm people and the environment have encouraged state environmental agencies to become active in adopting regulatory controls. The releases could contaminate groundwater, contaminate surface areas that serve as temporary holding ponds for flowback wastes, and contaminate air resources.

This paper looks at legislative and regulatory provisions to discern how governmental actions are balancing the production of shale gas with responsibilities to protect land, water, and air resources as well as human health. An evaluation of the regulatory provisions employed to regulate shale gas production leads to three suggestions. The first is to provide governmental officials and the public greater access to information about the toxic chemicals being used to fracture wells. A second suggestion involves the implementation of mechanisms that would provide monies to use in addressing cleanup costs and damages. Third, how can regulatory mechanisms be restructured to encourage innovation including reductions in the use of chemicals that might lead to pollutants being discharged into the environment. While increased natural gas production is important, governments might be more active in adopting mechanisms to address damages accompanying fracturing activities.

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Effects of Sodium Bicarbonate Concentration on Biomass Growth of Algae Nanochloropsis Sp

The purpose of this study was to find the optimum bicarbonate concentration that is suitable for the production of the largest amount of microalgae *Nanochloropsis* sp. Algae farming meets the current needs of carbon dioxide fixation with the current benefit of biofuel production. *Nanochloropsis* sp. is a marine alga that has high oil content on top of a large biomass production. This study joined the effort to explore the ways that enhance the productivity of this alga. The major variable of this study was the feed concentration of carbon source, for which $NaHCO_3$ was used at concentration ranging from 1 to 30 g-HCO_3^- l^{-1}. Batch type reactors containing the modified Walne medium were operated under growth conditions within favorable ranges, which conditions included: 2.5% NaCl, 50 mg l^{-1} NO_3-N, initial pH of 8.0, and continuous illumination of approximately 12000 lux. Test results showed that *Nanochloropsis* sp. grew to a biomass concentration higher than 0.8 g-dry-wt l^{-1} under the bicarbonate feed concentration around 14 g-HCO_3^- l^{-1}; biomass productivity reached an observed maximum of 0.56 g-dry-wt l^{-1} d^{-1}, and the concomitant CO_2 fixation was approximately 85% in a stationary phase attained in about 7 days. Productivity declined from this maximum, most probably due to (1) rise of pH, which was measured to be 9.5 at stationary phase, from consumption of CO_2, and (2) increased ionic strength in addition to that from NaCl salinity. From the series of growth tests with varying initial feed concentrations of HCO_3^- (C_s), changes in productivity, or rate of production (p), were determined. Productivities versus HCO_3^- feed concentrations were fitted to the Haldane model as if the feed was inhibitory. The resulting Haldane equation showed that the bicarbonate concentration for optimal production of this algal species was approximately 15 g l^{-1}, and that the quasi-Haldane equation for *Nanochloropsis* sp. production rate can be written as $p = \frac{1.45 C_s}{8.2 + C_s + C_s^2 / 24.2}$ (g l^{-1} d^{-1}).

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Reductive Degradation of NTO and DNAN in Industrial Wastewater Effluents by Fe/Cu bi-metal Treatment

The industrial production and development of new insensitive munitions (IM) has resulted in the need for developing new treatment schemes to effectively deal with industrial effluents and environmental releases.

Of particular concern are two components of IMs, nitrotriazolone (3-nitro-1,2,4-triazol-5-one, NTO) a white crystalline compound soluble in water (12.8 g/L at 19^0C) and 2,4-dinitroanisole (DNAN), a nitroaromatic compound poorly soluble in water (632 mg/L). NTO high aqueous solubility renders adsorption-based technologies ineffective for the treatment of wastewater generated during NTO manufacturing. This paper describes the use of a bi-metal (Fe/Cu) based technology in two different configurations, a batch complete mixed two phase reactor and a continuous upflow reactor. NTO is an organic acid of considerable strength (pKa = 3.76) and its reduction by Fe/Cu bimetals is strongly dependent on the pH. A significant increase in the reduction rate was observed when the pH was reduced from 3.0 to 2.8. The same pH reduction did not affect the DNAN degradation rate. The computed half-life of NTO and DNAN under optimal treatment conditions at 20^0C, were 14 and 1 minute, respectively. Pseudo-first order degradation kinetic constants were computed and by products of the degradation process were identified by electrospray ionization mass spectrometry (ESI-MS). Bimetal Fe/Cu degradation of the NTO/DNAN-containing wastewater generated urea and potentially small quantities of formaldehyde and ammonia along with

nitrogen oxide gases (especially N_2O). A potential mechanism for the formation of urea from NTO is advanced. Other NTO degradation products postulated in the literature were not observed.

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Evaluating the Quality of Socio-Economic Features in Isfahan's Urban Environment

The sustainable human life cannot be achieved without sustainable local communities and cities are the key players of changing lifestyles, production, consumption and spatial patterns toward sustainability. A sustainable city might be defined as a city that provides an acceptable standard of living for its human occupants without depleting the ecosystem and biogeochemical cycles on which it depends. It also includes economic and social aspects of change in addition to environmental features. Local governments form the other hand are close to where environmental problems are perceived and closest to the citizens and shares responsibility for the well-being of human kind and nature. So the heightened role of environmental quality as an urban public policy concern is linked with growing interest in sustainable urban development. Contrasting with these facts, inefficient urban planning and management and lack of coherent environmental policies has led to many of urban environmental problems in a lot of modern cities. The number and scope of these problems are significant and they are considering as serious threats to the health and safety of residents. Recent experiences have shown that the Indicators of environmental quality are extremely a valuable tool for evaluation of the efficiency of urban policies, ideas, projects and initiatives. So the objective of this study is to measure the city of Isfahan's environmental quality from the standpoint of socio-economic needs in the year of 2010. For this aim first we compared a variety of urban sustainability indicators, and then a collection of 22 indicators have been chosen and classified in the form of a simple mathematical model. The ability of data collection and measurability of indicators were the main criteria for choosing the desire Indicators. The results of evaluation of socio-economic needs showed that Isfahan's environmental quality obtained 70% of desirable situation. Within the evaluated measures, the Indicator of urban facilities with 91% of model's desirability and the Indicator of social environment with 43% had the highest and lowest qualities respectively. This result will show the road map of developing urban policies in future toward improvement of the environmental quality of the citizen's and nature.

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Monitoring the Antarctic Stratosphere after the Montreal Protocol

A DOAS spectrometer was installed in December 1995 in the Italian Antarctic station at Terra Nova Bay (74"26'S, 164'03E', in the region of the Ross Sea), after several tests both in laboratory and in Antarctic region, for unattended and continuous measurement in extreme high-latitude environment.

Since 1995 the instrument, called GASCOD (ie Gas Analyzer Correlating Optical Differences) carried out a full dataset of zenith scattered light measurements; by applying the DOAS methodology to the collected data the total column and vertical profile of trace gases such as ozone, nitrogen dioxide, OClO and BrO are retrieved. The GASCOD is still working and producing very interesting data for the study of the denitrification processes during the formation of the so-called ozone hole over the Antarctic region. For the continuous NO2 monitoring for whole the year, also during winter when the station is unmanned,

the [407 - 460] nm spectral region is investigated. The instrumental setup is presented.

The time series of NO2 vertical columns obtained during the whole period of activity of GASCOD at TNB are presented and discussed. The diurnal and seasonal variations of stratospheric NO2 are highlighted.

The correlation of NO2 with ozone, temperature and potential vorticity (PV) in the mid-lower stratosphere are also discussed.

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An Innovative Approach to Managing Industrial Parks and Closed Landfills

Industrial parks are becoming noticeable features of the global landscape. Due to their improperly planned construction and the nature of the industries located in them, some parks are blights in the landscape with attendant health and environmental impacts. The Burnside Industrial Park in Halifax Regional Municipality, Nova Scotia, Canada is an example of these. The 7500 acre park is located at the north end of the city of Dartmouth and houses over 3500 medium and large size businesses employing over 45 000 people. The rapid development of the park and the continued increase in the established industries has led to drastic increase in waste production. One component of the solid waste management of the past was an open dump site, which was the main method of disposal for over 20 years. It was used with no regard for the environment, pollution control or aesthetics. The waste deposited included municipal, industrial, agricultural and demolition wastes as well as old tires and automobiles. The site served as a burning ground, as a solution to volume reduction. The leachates from the landfill and the runoff from past and new developments in the park are finding their way into Wright's Brook, Enchanted Lake, Flat Lake and Halifax Harbour. These waterways are also polluted with old tires, oil spills, algae blooms, foams and various chemicals including aluminum, arsenic, cadmium, calcium, chloride, chromium, copper, iron, lead, manganese, magnesium, potassium, sodium, strontium, zinc, ammonium sulphate, benzo(a)pyrene and phenantherene. In this project, *we developed an environmental park that included a surface flow wetland, a solar powered* model scale water purification system, an environmental sculpture, trails, rock gardens, bridges, picnic areas and educational signage. The project's goals are to protect natural waterways, protect and enhance wildlife habitats, foster environmental awareness and conservation of biodiversity through technical, cultural and artistic expressions. The site is used as a tourist attraction, recreational facility and serves as an outdoor educational facility for elementary and secondary schools and university students.

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Paradox of Coupling World Cultural Heritage Site and Casinos: Dilemma of Macau's Tourist Industry and the Reshaping of the Urban Environment

Since the liberation of casino licenses in 2002, Macau's gambling tourism is globalized by consortia from the United States; their investment in building a large number of hotels and casinos has brought Macau the highest average GDP growth rate in Asia. Tourism still drives Macau economy, which contributes almost 70% of the government revenue.

In 2005, UNESCO designated the southern half of Macao peninsula as a World Heritage Site, positively preserving many churches, forts and other heritage of this former Portuguese enclave that have been founded since the mid-16th century. This successfully glossed over the gambling tourism with a cultural dimension. However, new tourist infrastructure is often a threat to the sustainability of the cultural heritage in the urban environment, because the scarcity of land resources inevitably initiate conflict and competition of land and space, no matter inside or outside the buffer zone set by UNESCO.

The government resorted to land reclamation to resolve the problem of the shortage of land. Now, over half of the land in Macau is reclaimed land, and the ratio of original land to reclaimed land is the highest in the world. While reclamation changes the horizontal and coastal landscape of Macau, the ever-soaring high-rise buildings, mostly tourism facilities, also vertically change Macau's skyline. The UNESCO also showed concerns about the visual impact to the heritage sites owing to the change of the vertical landscape.

While priority is given to build tourism infrastructure on the newly reclaimed land, the government are unable to build housing estates to meet the need of this world's most densely populated city. The urban environment is worsening by the factor of the influx of individual mainland visitors, whose visit and arrival increase the population density and traffic congestion in the urban district.

Quantitative method is used in this paper to evaluate the survey of public opinion on the quality of life in Macau, and the actual government expenditure on heritage preservation from revenue gained from gambling tourism. The conclusion of this paper will bring out the effort of balancing the tension between the globalized gambling tourism and postcolonial heritage preservation in a sustainable way.

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Biohydrogen Production from Renewable Resources by Fermentatvie Bacteria

Hydrogen is considered to be an ideal and clean source of energy in the future. Biological hydrogen production would be one of the promising ways because of its environmentally acceptable characteristics. Studies on bio-hydrogen production mainly focus on bio-photolysis, photo fermentation and dark fermentation. Dark fermentative hydrogen gas production from carbohydrates is much faster than bio-photolysis but along with volatile fatty acids (VFAs) yield. Photo-fermentative bacteria can use VFAs as feedstock, which can be from dark fermentation effluent, for H2 production under light irradiation. In this study, four different photo fermentative bacteria (*Rhodopseudomonas palustris* (DSM 127), *Rhodobacter sphaeroides* (DSM 158), *Rhodobacter capsulatus* (DSM 1710), and *Rhodospirillum rubrum* (DSM 467)) were investigated on their characteristics of hydrogen production under anaerobic environment. Statistically based experimental designs were applied to optimize the fermentation process parameters for hydrogen production with sodium acetate as the sole carbon source. Furthermore, an orthogonal experimental design was used to test the co-cultivated potential between these species. The metabolic interaction between these organisms was also briefly discussed.

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Processing of the Pig Manure into Solid Multicomponent Mineral – Organic Fertilizers

Problems with storage and management of manure from pig farming on the one hand and possibility to use the manure as a renewable source of fertilizer components on the other hand encourage seeking new effective methods of manure management. For reduction of odor emission and costs of storage and transportation as well as for proper preparation of the manure for further treatment, the material has to be separated into solid and liquid fractions. We worked out the new method providing treatment of pig manure by filtration. Further processing of after filtration sediment into mineral - organic fertilizers was the second stage of our research.

In the after filtration sediment used for production of solid fertilizers moisture content and chemical components of the sludge was determined. Moreover, elementary analyses of P, Ca, Mg, S, K, N, C and H contents in the sludge were carried out. Due to utilization of sediments as fertilizers the tests determined content in sediments of available for animal's phosphates. In after filtration sediments concentrations of available nitrogen compounds, potassium, calcium and ICP analysis of microelements and heavy metals were determined too.

The compositions of different type of fertilizers with use as main component of the after filtration sediments with proper microelements were worked out. These mineral-organic fertilizers were proposed for such type cultivation as corn, crops, potatoes, beets, rape, root crops, leys and pastures and universal type phosphate fertilizer.

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Valuating Marine Living Resources: Effects of Technological, Marketing and Management Choices

The use of renewable natural resources always raises the issue of sustainable exploitation. Nowadays, pressure on several fish stocks is too high and threatens marine ecosystems. In the European Union, the general strategy followed by public policies up to now mostly consisted in reducing the number of fishing vessels in order to decrease the pressure on stocks.

The economic evaluation of such environmentally based public policy takes into account changes in the level of employment and the profitability of the fishing sector, but does not consider the other advantages of maintaining in place the fishing activities, such as the non-use values for coastal communities or the other sources of welfare. As a result, the value of the services provided by a fishing fleet can be underestimated, which can affect the general effectiveness of the environmental policy.

We propose here to adapt the method of the total economic value, usually used for the economic evaluation of environmental and cultural heritage goods, to have a global evaluation of all the values resulting from the presence of a fishing fleet in a coastal area.

This analysis is part of the INTERREG GIFS project, seeking at studying the socio-economic and cultural values of inshore fisheries to incorporate it into fisheries policy and coastal development strategies.

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Incorporating a 'Friendly Environmental Csr Model' for Sustaining Future Dimension: Needs and Demand

Corporate Social Responsibility incorporates social contract between businesses and its stakeholders such as the society, government, environment, and future generations. Although the role and existence of businesses is to gain profit, the legitimacy of stakeholders' interest should not be compromised. Current issues of environmental concerns such as water pollution, global warming, ozone depletion and climate change have to be appropriately addressed by the corporations to ensure the implementation of good ethical conduct and sustainable development. This has somewhat compelled corporations under strict scrutiny with regard to their activities – leading to improved interaction between the two (stakeholders & corporations) and better conduct from the corporations. In line with the current scenario, this paper contributes to the academic debate by reviewing past attempts of Corporate Social Responsibility (CSR) models by identifying the gaps and the weaknesses of previous models. Gap analysis will be conducted in order to identify the variation between current CSR practices with the expected CSR practice that focuses on the responsibility, environmental protection, and green technology innovation. The paper is theoretical in design and is based on desk research comprising of a literature review, including key, concepts, ideas, theories, frameworks, and models on some certain chosen areas related to the topic. This study makes a content analysis method to get a conclusion and identifies different dimensions of CSR models.

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Catalytic Activity of Mesoporous SBA-15 Modified with Pt and Ti in a Deep Methane, *N*-Hexane and CO Oxidation

In the past two decades, nanostructured materials have attracted intensive attentions owing to their potential properties. The mesoporous support supplying abundant and well defined in size pores and large surface area, would give rise to well-dispersed and stable metal particles, thus revealing a great potential in further improvement of the catalytic performance. Appropriate combinations of Pt and supports may lead to the formation of highly active catalysts.

Ti-SBA-15 composite materials containing 5 and 10 % Ti are obtained by direct synthesis (samples denoted Ti-SBA-15) or by impregnation of SBA-15 with titanium isoporopoxide solution (i-Ti-SBA-15). After calcination, the composite Ti-SBA-15 oxides are impregnated with an aqueous solution of a Pt precursor in order to ensure 0.25 wt% Pt. The calcined samples are characterized by SEM, TEM, XRD, XPS, FTIRS and tested in reaction of complete methane, *n*-hexane and CO oxidation.

The state of platinum in the titanium modified SBA-15 depends very much of the method of Ti introduction. When Ti is introduced by direct synthesis in the starting gel, the titanium in the final materials is well crystalline rutile and anatase. After deposition of platinum by impregnation and next calcinations the finely dispersed Pt metal and Pt_2O are formed on the support. The modification of pure siliceous SBA-15 with titanium by impregnation results in the formation of two types finely divided TiO_2 on SBA-15 support – less and strong interacting with the framework of SBA-15. The introduction of platinum on this sample leads to the formation only of metal Pt with

mean diameter 20-40 nm. The order of activity in methane, *n*-hexane and CO oxidation is as follows: Pt-iTi10 (d_{Pt}=40 nm) > Pt-Ti10 > Pt-iTi5 (d_{Pt}=20 nm) > Pt-Ti5 (d_{Pt}=40 nm). The catalysts in which Pt is in a form of large metal particles and TiO_2 is finely dispersed on the support exhibit higher catalytic activity. The presence of water caused an increase in catalytic activity and this is more remarkable for impregnated samples. The deactivating of catalysts after stability test is ascribed to the decoration of Pt by titanium. The ratio Pt/Ti on the surface decrease very much after stability tests.

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CFD Analyses on the Entrained-bed Coal Gasifier of Korean IGCC Test-bed Facility

IGCC(Integrated Gasification Combined Cycle) is an emerging clean coal technology with superior energy and environmental efficiencies compared with conventional coal-fired boiler system, so worldwide R&D efforts on IGCC have been being performed in USA, Europe, China, Japan and also in Korea. Korean IGCC project has been focused to develop 300MW commercial scale power plant and new coal gasification process through 50 ton/day test-bed coal gasification facility. In the present study, computational analyses are conducted on Korean IGCC test-bed coal gasifier to optimized burner design by CFD method. The CFD modeling is made by combining Reynolds-stress averaged Navier-Stokes equation solvers, turbulence, discrete phase and gasification reaction models. The present CFD simulation method calculates gas flow path, coal particle track, temperature, CO and H2 distributions inside gasifier with changing the secondary oxidizer injection ratio as a burner design condition, and their calculation results are compared and examined to optimize burner design. From the analysis results, it is concluded that the highest carbon conversion and cold gas efficiency are achieved when the secondary injection ratio of burner is 0.5.

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The Role of Urban Green Areas for Quality of Life

This paper presents the issues of residential areas dating from the time of political and economic changes in the early nineties, and the transition to a market economy in Ljubljana, Slovenia. This research aims to perform an evaluation of urban green areas from the aspect of users, its main focus being the new urban residential developments. Compared to the older neighbourhoods, the newer ones are typically single-use residential, while their open spaces are reduced in size and programme. A lack of appropriate accessible open green areas results in spending the majority of time indoors. The indoor air is known to be polluted with several chemicals, nano-particles, microorganisms, electrosmog etc. Spending time indoors should therefore be balanced with the time spent outside. So we are faced with two contradictory facts: the importance of outdoor activities on one side and the new urban planning concepts that enforce urban regeneration which focuses on densification and reuse. Key research problem deals with the quality of life in these areas, measured especially in the context of needs of the most vulnerable users, mainly the elderly and children. Both depend on well accessible green areas in near proximity to their homes. This paper explores how the residents experience the new spatial organisation of their living environment, and how the poor quality open spaces may affect their health, more specifically the behavioural patterns, which reduce or strengthen personal health. The research is planned in three methodological phases: a comparison between urban residential areas by selected criteria and indicators of quality of life, behaviour mapping and interviewing of residents in selected residential areas. In the first phase of the comparative study, differences between open spaces of the selected residential areas were measured and confirmed: in comparison with older neighborhoods newer are denser and have less potential for spending time outside while being inhabited by more children. The second phase, observation and behavioral mapping, results in identification of outdoor activities: a lack of outdoor programs increases transition activities. The interviewing process involves the actual inhabitants of settlements, providing their personal view of their home environment and behavioral style.

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Engineering Shewanella Biofilm for Enhanced Electricity Output in Microbial Fuel Cells

Microbial fuel cell (MFC), as a novel sustainable biotechnology that can harvest bioelectricity from wastewaters, has attracted extensive attention in recent decades. In MFC, exoelectrogens (i.e., electrochemically active bacteria) on the anode surface are responsible for oxidizing organic compounds and transferring electrons to anodes . *Shewanella oneidensis* MR-1 is one of the most efficient exoelectrogens, which has been studied intensively to understand the mechanisms of extracellular electron transfer and related metabolism pathways.

At this moment, electricity power output of MFCs remains low, which restricted MFCs' adoption in practical applications. Electroactive biofilms have a significant impact on MFCs' power density. However, little research has done to clarify the relationship between *Shewanella oneidensis* MR-1 biofilm formation on the anode and its power generation. Understanding the impact of biofilm on electricity generation is of great help in rationally optimizing MFC systems and improving the yield and efficiency of biological conversion process in MFCs. Recently, it was recognized that bis-(3'-5')-cyclic dimeric guanosine monophosphate(c-di-GMP) acts as a central role in controlling biofilm formation. We thus constructed an inducible diguanylate cyclases (DGC) gene encoding an enzyme synthesizing c-di-GMP, to study the relationship between biofilm formation and extracellular electron transfer via c-di-GMP in *Shewanella*.

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Development of Porosity of Hemp Stern-Based Activated Carbon Produced by Phosphoric Acid Activation in Steam and Nitrogen Atmosphere

Hemp (Cannabis sativa L.) is most productive herbaceous plant which is cultivated mainly for its bast fiber and seed oil. Therefore, hemp finds a lot of industrial applications such as in production of paper, textiles, building materials, food, medicine, paint, detergents, oil and fuel. A substantial amount of hemp-derived waste is the by-product. The use of hemp-derived waste as precursor for activated carbons (ACs) could provide an additional way of hemp disposal.

This study shows a high ability of hemp stem of developing ACs with high fractions of micropores and/or mesopores during phosphoric acid activation process. Tailoring of the chemical activation conditions such as the amount of activating agent, the soaking time and gaseous atmosphere allows to control the porosity in hemp stem-based ACs. The hemp stem-based ACs prepared in this work show the BET surface area ranging from 825 to 2507 m^2/g, the total pore volume of 0.640 to 2.430 cm^3/g with mesopore fraction from 0.20 to 0.67. The microporous carbons are developed at low concentration of the activating agent, when the activation process is carried out in both steam and nitrogen. Increasing amount of H_3PO_4 leads to widening of pores. Steam favors evolution of large mesopores (30-50 nm), while the presence of nitrogen develops narrow mesopores (2-5 nm). ACs with a well-balanced meso- and micropores are achieved by applying 30% H_3PO_4 and the soaking time of 10-30 min. Prolongation of the activation process to 60 min results in porosity degradation. In contrast to the nitrogen atmosphere, steam reduces both micro- and mesopore volumes of ACs if a high impregnation ratio is used.

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Chemical Looping Combustion of Coal for CO2 Capture: Process Simulation and Optimisation using Aspen Plus

Chemical Looping Combustion (CLC) is a promising novel technology that can be used to mitigate CO2 emissions from power plants using solid fuels like coal. CLC process has been researched from the past 25 years and has made significant progress over the last decade. A CLC system consist of two reactors, an air reactor which is also called oxidiser and a fuel reactor, also known as reducer, between which an oxygen carrier (OC) is circulated to supply oxygen for the fuel combustion in the reducer. The OC particle often is a metal oxide which is regenerated in the oxidiser using air or steam. This arrangement prevents dilution of flue gas with nitrogen and produces an exhaust stream of mainly steam (H2O) and carbon-dioxide (CO2) as products from the combustion of fuel. The steam can be condensed to obtain a pure stream of CO2 for capture and storage.

The work compares CLC technology with amine scrubbing processes currently used in the industries for CO_2 capture. The study also analyse the performance of different CLC systems with and without coal gasification process for both hydrogen and energy generation. As part of this work, Aspen Plus models for industrial processes including Integrated Gasification Combined Cycle (IGCC) with CLC and with amine scrubbing has been developed using experimental data and literature. The suitability of iron oxides as an OC particle for CLC of solid fuels has been discussed. The work evaluates the effects of various operating conditions like temperature, pressure and fuel flow rate on the system and discusses the challenges of direct combustion of solid fuels in the CLC reactor system.

The study shows that CLC technology is more efficient in terms of energy and CO_2 capture than Methyl diethanolamine (MDEA) and Monoethanolamine (MEA) scrubbing technologies. The results show that syngas conversion of more than 99% and OC conversion of around 50% can be achieved using iron oxides in CLC.

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Carbon Footprint of Straw Mushroom: A Case Study in Thailand

Carbon Footprint of product is a tool to calculate the quantity of GHG emissions from each production unit throughout the whole life cycle of a product start from the raw material acquisition, manufacturing, use, distribution and disposal. This tool is increasingly necessary for consumers to be informed the carbon footprint information for supporting their purchasing decision in Thailand. Therefore, the objective of this study is to analyze the carbon footprint of straw mushroom production to the environment. The method used is based on Thailand Carbon Footprint Guideline, which functional unit of the calculation is 1 kg of mushroom product. The inventory data were collected from the farm at Nakornsawa province, Thailand. The results were compared the carbon footprint of straw mushroom production with soybean, rape seed and cassava formula. The result of this study indicated that the straw mushroom production with rape seed had the highest carbon footprint. The comparative of carbon footprint of three formulas were 5.41 $kgCO_2$-eq for soybean formula, 19.08 $kgCO_2$-eq for rape seed formula and 4.22 $kgCO_2$-eq for cassava formula. Mostly, the production stage had the greatest GHGs, 3.45 $kgCO_2$-eq from soybean formula. Furthermore, the Eco-Efficiency was to selected in order to evaluate the environment and economic of mushroom production. The result shown that the straw mushroom production with cassava had the greatest Eco-Efficiency that was 2.93 Baht/kg CO_2-eq, following by rape seed formula at 3.22 Baht/kg CO_2-eq and soybean formula at 3.62 Baht/kg CO_2-eq. Therefore, the straw mushroom production with cassava formula was the best among those production methods.

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Biodegradation of Hexachlorocyclohexane in Solid and Slurry Phases

Hexachlorocyclohexane (HCH) is an organochlorine insecticide widely used world-wide until the 1970s. Most countries have restricted its use because of the risk of health effects and environmental problems. The pesticide is a mixture of isomers (α, β, γ, δ) produced by the chlorination of benzene in the presence of UV light. Many countries, including Brazil, are still suffering with the pollution of its soil and water, so, obtaining bioremediation of this compound is important to reduce the exposure of people to contaminated areas. The most well-known HCH-degrading bacteria are members of the genus Sphingomonas (formally Pseudomonas),which have aerobic metabolism and are found in upland contaminated fields. This work focused on the biodegradation of HCH using microorganisms endogenous to a contaminated soil from São Paulo – Brazil. Firstly, this soil was spread-plated in TSA (Tryptic Soy Agar - Oxoid CM 129) and after 48 hours, it presented 2,4x106 CFU/g of soil. Then, the experiments were carried in solid phase and slurry, both using aerobic condition, discontinuous reactors, temperature (25ºC) and humidity controlled. The difference between them was the amount of water, the solid phase had 18% of water and the slurry had 70%. The solid phase test had the duration of 12 months and was carried in amber bottles with O2 flow. The slurry lasted 6 months and was carried inside the shaker with agitation (120 rpm) at 30ºC (O2 could reach the interior of the flask through the cotton lid). Three conditions were tested in both phases: 1 – contaminated soil plus water; 2 - contaminated soil plus mineral solution (biostimulation); 3 - contaminated soil plus mineral solution plus microorganisms (biostimulation and bioaugmentation). Each flask from condition (1) had an amount of 225 g (solid phase) and 30 g (slurry) of soil; plus water (solid phase: 16 mL; slurry: 70 mL). The

other conditions had the same amount of soil and water of condition (1) plus mineral solution (condition (2), solid phase and slurry: 5 mL) or, plus microorganisms (condition (3), solid phase and slurry: 8 mL with 104 CFU/mL of water solution).

All the analysis were determined by chromatography, using: US EPA method 3541 (automated Soxhlet extraction), US EPA analytical method 8081 for organochlorine pesticides, and a Hewlett-Packard 5890 Series 2 gas chomatograph with an electron-capture detector (GC-ECD).

The results showed that the solid phase had percentages of degradation around 70% (solid phase conditions: (1) 71.10%, (2) 76.10%, (3) 74.20%). (conditions: (1) 98.40%, (2) 98.90%, (3) 99.30%). The slurry phase presented 90% of degradation,

The improvement was probably due to the dilution of the HCH crystals in water (bigger amount of solvent plus agitation), since this compound has low solubility (5-10 g/L at 20^{o}C), turning it more suitable for the microorganisms to make contact and consume the pesticide. Adding mineral solution and more microorganisms in the soil did not show expressive differences in the final results. These parameters could be more valuable for stimulating degradation in shorter period tests.

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Assessing the Economic Value of a Fishing Fleet

The use of renewable natural resources always raises the issue of sustainable exploitation. Nowadays, pressure on several fish stocks is too high and threatens marine ecosystems. In the European Union, the general strategy followed by public policies up to now mostly consisted in reducing the number of fishing vessels in order to decrease the pressure on stocks.

The economic evaluation of such environmentally based public policy takes into account changes in the level of employment and the profitability of the fishing sector, but does not consider the other advantages of maintaining in place the fishing activities, such as the non-use values for coastal communities or the other sources of welfare. As a result, the value of the services provided by a fishing fleet can be underestimated, which can affect the general effectiveness of the environmental policy.

We propose here to adapt the method of the total economic value, usually used for the economic evaluation of environmental and cultural heritage goods, to have a global evaluation of all the values resulting from the presence of a fishing fleet in a coastal area.

This analysis is part of the INTERREG GIFS project, seeking at studying the socio-economic and cultural values of inshore fisheries to incorporate it into fisheries policy and coastal development strategies.

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Urban Drainage Treatment Sustainability: Measurements and Models

The urban environs are a complex constructed interface that alters rainfall-runoff relationships, and through the generation of anthropogenic constituents results in transport of chemical, thermal, microbiological and particulate matter (PM) loads. In North American cities with municipal separate storm sewer systems (MS4s) the load of volumetric runoff, chemicals and PM are equal to or greater than the untreated influent loads to municipal wastewater treatment plants (WWTP) yet the management of urban runoff loads is at least a half century behind wastewater management yet is greater in scale and cost. Urban drainage management and reuse is very challenging; in part due to PM hetero-dispersivity, interactions between aqueous and PM phases, stochastic hydrology and highly unsteady hydrodynamics.

Experience over the last several decades has demonstrated that there continues to be a gap in knowledge transfer between the design, analysis and monitoring of what are nominally called "Best Management Practices" (BMPs), fundamental unit operations and processes (UOP) concepts, sustainability requirements for BMPs, as well as new developments in the behavior of green urban infrastructure. Despite such disparity, tools such as UOP concepts, monitoring tools such as laser diffraction, and continuous simulation modeling are removing stormwater controls from the category of "black-boxes". With such tools we can now demonstrate treatment viability as a function of the hydrologic, physical, chemical, biological and thermal phenomena for rainfall-runoff or snowmelt. Success requires the integration of these coupled phenomena. This synthesis is critical whether the objective is hydrologic restoration, source and near-source control, water chemistry control, water reclamation and reuse, or often, a combination of these. However, stormwater systems that do not provide some level of hydrologic restoration, for example through "green" infrastructure materials, are not sustainable. Stormwater treatment, sustainability and green infrastructure will play a critical role in the entire urban water cycle and therefore we must develop maintenance practices such as pavement cleaning, source control and near-source control. Further advances with respect to sustainability of urban water requires tools such as continuous simulation models, smart sensors and modeling advances such as computational fluid dynamics (CFD) and a focus on UOP concepts as shown in Figure 2. While urban

runoff phenomena are complex, these complexities can be resolved to varying degrees with modeling cases that range from a combination of Newton's Law combined with Type I settling to CFD. While this example illustrates the fate of PM, it should be recognized that the ability to predict the fate of chemical (partitioning to and from PM), physical and microbiological constituents in urban runoff (or for wastewater) ultimately requires the coupling of the continuous phase hydrodynamics (Eulerian framework) and a discrete phase model (DPM) for PM (Lagrangian framework).

Part I examines the role of our constructed environs and activities therein on the urban water cycle and coupled delivery of constituent loads that impact the environment, reuse of this water resource and ecology including human ecology. Part I examines these constituent and microbiological loads fundamentally and recommends management tools such as continuous simulation of hydrologic restoration to restore sustainability of the urban water cycle and illustrates the strength of CFD. Results illustrate the current practice of MS4s with thousands of "Best Management Practices" (BMPs) is not sustainable. The future will require these advanced management tools, centralized treatment and frequent maintenance practices.

Sustainability will ultimately require source control of loads, green infrastructure and hydrologic restoration. An emerging challenge in North America is the use of reclaimed wastewater back onto the urban interface with commensurate volumetric benefits yet chemical legacy concerns. Part II illustrates the role of urban sustainability practices or lack thereof (maintenance interval) on resource, load and chemical recovery while illustrating the impact of advanced treated wastewater generates on the urban environment.

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Removal of Cu, Ni and Zn from Polluted Water by Agricultural Wastes

The pollution of water resources due to the disposal of heavy metals has been an increasing worldwide concern for the last few decades. The adsorbents used in this study included low coast agricultural by-products, such as Rice husk (RH), Sesame seed husk (Ses) and Sunflower seed husk (Sun). The values of 1/n for Cu ion removal by RH, Ses and Sun were 0.8085, 0.802, 0.753, for Ni ion were 3.386, 1.572, 0.853, and for Zn ion were 2.609, 1.422 and 0.629 respectively. Equilibrium adsorption data were best explained by D-R isotherm, which means that the adsorption process has a multilayered characters and the adsorption surface is not uniform and possibly has a heterogeneous structure. Physisorption dominates the adsorption mechanism because the energy of adsorption of Cu, Ni and Zn on the studied adsorbents was lower than 8 $kJmol^{-1}$. The objectives of this study were to reduce the residues whose disposal becomes major, costly problem and to convert the wastes into useful and inexpensive adsorbents for water purification. Moreover to evaluate the adsorption potential of RH, Ses, Sun for Cu, Ni, and Zn removal from aqueous solution through the equilibrium studies of adsorption process.

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The Distinctive Impact of Copper-Based Fungicide Application in Brazilian Wet Subtropics

The vine-growing areas in Brazil are the dampest in the world. High humidity and rain require more frequent applications of copper-based fungicide than in other viticulture regions. Copper maximum value registered in Brazilian old vineyards is as much as 3200 mg/ kg, i.e. several times higher than maximal value reported for vineyard soils in temperate climates of the Europe. Mobile fractions of copper predominate in top layers, contributing to contamination spreading downward. Copper accumulates on the underlying iron hydroxide barrier in quantities comparable to total copper concentrations in the surface horizon. Despite the impediment of the geochemical barrier, most applied copper in sandy soils reaches the aquifer, polluting the groundwater. The soils from basaltic volcanic rocks reveal the highest values of Cu extracted with CaCl, demonstrating a high capacity of copper transference into plants. In the surface horizon of the contaminated sandy soils in wet subtropics, bioavailable copper surpasses the toxic threshold for plants up to several times. When evaluating the risks of copper's toxic effects in subtropics, the soils from rhyolitic volcanic rocks are more worrisome, as the Cu extracted with ammonium acetate 1 M surpasses the toxic threshold as much as 4-6 times. Other pesticide-derived metals accumulate in the topsoil layer, surpassing in the old vineyards the background value several times for Zn, Pb, Cr and Cd.

Copper-based fungicide application in a wet subtropical climate leads to out of the ordinary metal pollution of the environment.

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Air Pollution Monitoring Using GIS, GPS and Gas Sensors for Chennai City

Environmental impacts of air pollutants have impact on public health, vegetation, material deterioration etc. To prevent or minimize the damage caused by atmospheric pollution, suitable monitoring systems are urgently needed that can rapidly and reliably detect and quantify polluting sources for monitoring by regulating authorities in order to prevent further deterioration of the current pollution levels. Air pollution is a serious problem in thickly populated and industrialized areas in Chennai. The air pollution in Chennai is abundant, especially in areas where pollution sources and the human population are concentrated. Economic growth and industrialization are proceeding at a rapid pace, accompanied by increasing emissions of air polluting sources.

So as to carry out air pollution monitoring over an extensive area, a combination of ground measurements through inexpensive sensors and wireless and internet GIS was used for this purpose. This portable device, comprising solid state gas sensors integrated to a Personal Digital Assistant (PDA) linked through Bluetooth communication tools and Global Positioning System (GPS) allowed rapid dissemination of information on pollution levels at multiple sites simultaneously. The Air Quality report generated published using Internet GIS to provide a real-time information service for the PCD, for increased public awareness and enhanced public participation. It is proposed to collect data from 10 stations over a period of time and the same was analysed. It shows that few location are the level of pollution is higher than the standards prescribed by Tamilnadu Pollution Control Board. The air quality report generated from this work will be more detail, including information such as air quality interpolated maps, relating to other information for better understanding the air quality level. For these reasons, this work is aimed to build up an easy monitoring system using low cost portable gas sensing systems so as to carry out air

pollution monitoring over an extensive area and to be able to report real time air quality data through Wireless Internet GIS. To facilitate the problem of analyzing and monitoring air pollution, and also to assist in establishing priorities and measurements of air pollution in the Chennai city this method is proven to be much useful.

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The Management of Vilnius' Rainwater Runoff System: Achievements, Problems, Prospects

As a significant part of the city, the pollution control and resource recovery of urban street rainwater are attached with more and more importance. EU Water Framework Directive 2000/60/EC emphasizes the need to solve fundamental problems that occur when urbanized rainwater runoff is injected into the bank of water. One of the principal objectives of the Directive is to reach "a good status" of all the Community waters and to ensure its maintenance until 2015. HELCOM Recommendation 23/5 (2002) calls for preventing or at least minimize rainwater runoff pollution by harmful substances in order to assist the Baltic Sea – one of the most vulnerable seas – ecological state rehabilitation.

All major Lithuanian cities already have domestic runoff treatment facilities. Currently, in the capital of Lithuania the largest pollution into the banks comes with the storm water through rainoffs. Many authors studied the influence of storm water pollution on the ecological state of banks' water. This article analyzes the Vilnius City's rainwater runoff management problems that arise in the conditions of sustainable city development when some attempts to combine social, economic and environmental interests into a single whole, as more fully meet the needs of the urban population. The authors of the article are managers of municipal company that operates the rainoff of the largest Lithuanian city. They present the existing system of urban storm water collection and treatment comprehensively, evaluate its positive sides, name weaknesses and look for opportunities to solve problems that arise due to insufficient legal framework, lack of normative documents and uneven growth of residential areas of the capital of Lithuania.

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Study of Methylmercury Biomagnificationww in Wistar Rats(Rattus novergicus) Fed with Methylmercury contaminated Tilapia (Oreochromis niloticus)

In the present paper, the biomagnification of methylmercury was studied in Wistar rats (*Rattus norvergicus*) fed with tilapia fish (*Oreochromics niloticus*) that were fed with diet contaminated with methylmercury. Wistar rats have several characteristics common to mammals in general and are frequently used in biomedical studies of physiological and morphological nature. Two groups of fish were fed with contaminated diet (Hg concentration 1= 1.03 ± 0.15 μg g^{-1} and Hg concentration 2 = 8.27 ± 1.25 μg g^{-1}) and one group was fed with diet not contaminated with methylmercury (control group). The experiment was conducted for a period of forty two days. Afterwards, two groups of Wistar rats were fed, via gavage, with tilapia fish muscle diets, contaminated with methylmercury from the previous experiment (Hg concentration 1 = 0.31 ± 0.03 μg g^{-1} and Hg concentration 2 = 3.04 ± 0.94 μg g^{-1}) for twenty eight days. Another group was fed in the same way with fish muscle diet from the controls of the tilapia experiment. The rats were fed with one gram of crushed and homogenized fish feed and afterwards they were fed *ad libitum* with their usual pelletized feed. In the rats, the blood and biochemical parameters as well as somatic relations were analyzed periodically and did not present significant differences between the evaluated groups. In the other hand, the rats that were fed with fish muscle containing the highest level of added methylmercury presented higher bioaccumulation of Hg in the kidney, liver, spleen, muscle and brain if compared to the group with lower added Hg. Methylmercury was determined as total Hg by CV AAS. The results showed the following comparative degree of accumulation of Hg: kidney > liver > spleen > muscle = brain.

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Assessment of Hypoxia and its Relationship with Nutrient Loads and Wind, and Implication in the Chesapeake Bay Management

This paper addresses our opinions on the recently debates of relative importance of nutrient load and wind in regulating summer hypoxia of the Chesapeake Bay. The Bay's hypoxia is evaluated from nearly three decades of observed data that were sampled once or twice a month in about 60 monitoring stations. The annual summer hypoxic volume shows certain correlation with nutrient loads. On the other hand, the pilot high frequency (in every 15 minutes) observations and the modeled hourly dissolved oxygen concentrations show significant effect of wind on dissolved oxygen and hypoxia.

Since the long term monitoring events are only snapshots, they may not equally correspond to wind variations in different years. Therefore, such assessed hypoxic volume may not truly reflect the interannual changes in hypoxia. While the water quality model simulates the responses of dissolved oxygen to nutrient load via complicate bio-chemical processes and wind-modified hydrodynamic circulations, including the responses under various wind conditions. Daily modeled hypoxic volume and monthly monitored hypoxic volume are compared and analyzed against to the observed wind speeds and durations for four directional components. The Pearson correlation coefficients indicate that both modeled and observed annual hypoxic volumes have positive correlation (e.g., 0.8) with nutrient load, and negative (e.g., -0.3) with wind speed. The hypoxic volume has stronger correlation with nutrient load than with wind. The observed and modeled data indicate that the cause of hypoxia is mainly due to excessive nutrient load and the related bio-chemical processes that elevate sediment oxygen demand, while episodic strong wind events can partly erode hypoxia. Nutrient load is a more important factor than wind that governs the interannual hypoxia variations. This paper suggests optimal sampling design and method to evaluate hypoxic volume. The analysis provides information for Chesapeake Bay water quality management.

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Polybrominated Diphenyl Ethers in Wastewater Treatment Plants and Their Removal

Polybrominated diphenyl ethers (PBDEs), a family of compounds used as flame retardants, are persistent organic pollutants (POPs) in the environment and cause serious health risk to human. Wastewater treatment plants (WTPs) have been considered as a sink of PBDEs. However, the presence of PBDEs in Hong Kong's sewage and the efficiency of different treatment processes in WTPs to remove PBDEs have not been reported. The present study therefore aims to investigate the contamination of PBDEs in four WTPs in Hong Kong SAR. The composition, concentrations and fate of eight PBDE congeners during the treatment processes were also analyzed. Among these four WTPS, Stonecutters Island and Shatin WTPs receive mainly municipal sewage, while the other two WTPs (Yuen Long and Tai Po WTPs) accept both municipal and industrial sewage. Stonecutter Island WTP employs the enhanced primary sedimentation process while the other three WTPs include both primary sedimentation and secondary biological processes. The results showed that BDE-209 was the most dominated congener in all four WTPs, followed by BDE-47 and -99. However, the concentrations of total PBDEs in the influent of Tai Po and Yuen Long WTPs were much higher than that in Stonecutters Island and Shatin WTPs. The congener profiles were also different among WTPs. These findings suggested that the main source of PBDE contamination in municipal sewage was different from that in industrial sewage. Correlation analysis showed that tri-, tetra-, penta- and some extent of hexa-BDEs were significantly correlated to each other, but these congeners did not have any significant correlations to BDE-209, indicating that penta- and deca-BDE commercial mixtures were the two main independent sources of PBDE contamination in wastewater. The concentrations of PBDEs in wastewater decreased dramatically during the treatment processes in all four WTPs. About 49-95% of PBDEs were removed from the sewage in WTPs. However, PBDEs were concentrated in dewatered sludge and around 0.2 to 55 g PBDEs in sludge were disposed to landfill daily. Everyday, a total of 1.4-22 g PBDEs was estimated to enter the four WTPs and 0.13-4.88 g PBDEs were discharged to the Victoria Harbor and Shan Pui River in Hong Kong. These results revealed that PBDEs in WTPs would be a

significant contamination source and pose potential risk problems in Hong Kong. It is essential to improve the removal efficiency of PBDEs in WTPs and reduce their amounts in both effluent and sludge.