2014

# Ecology & Water

## Second Annual International Conference on Ecology, Ecosystems and Climate Change & Second Annual International Conference on Water

14-17 July 2014, Athens, Greece

Edited by Gregory T. Papanikos

THE ATHENS INSTITUTE FOR EDUCATION AND RESEARCH

# Ecology & Water Abstracts

# 2nd Annual International Conference on Ecology, Ecosystems and Climate Change

&

# 2nd Annual International Conference on Water

14-17 July 2014, Athens, Greece

Edited by Gregory T. Papanikos

First Published in Athens, Greece by the Athens Institute for Education and Research.
ISBN: 978-618-5065-61-4


8 Valaoritou Street
Kolonaki, 10671 Athens, Greece
www.atiner.gr

# TABLE OF CONTENTS

*(In Alphabetical Order by Author's Family name)*

# Preface

This abstract book includes all the abstracts of the papers presented at the *2nd Annual International Conference on Ecology, Ecosystems and Climate Change & 2nd Annual International Conference on Water, 14-17 July 2014,* organized by the Athens Institute for Education and Research. In total there were forty-five papers and presenters, coming from 26 different countries (Algeria, Chile, China, Colombia, Czech Republic, Egypt, France, Hong Kong, India, Indonesia, Italy, Japan, Libya, Malaysia, Mexico, Philippines, Poland, Saudi Arabia, Serbia, South Korea, Spain, Taiwan, Turkey, UAE, UK, USA). The conference was organized into eleven sessions that included areas such as Terrestrial and Marine Ecology and Environmental Stresses, Water Quantity and Quality, Water Science, Climate and Society, Climate Change, Biodiversity and Energy, Waste Water and Water Treatment, Plants Growth and Distribution and other related areas. 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 six research divisions and twenty-seven 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**

# FINAL CONFERENCE PROGRAM

**2nd Annual International Conference on Ecology, Ecosystems and Climate Change & 2nd Annual International Conference on Water, 14-17 July 2014, Athens, Greece**

## PROGRAM

**Conference Venue**: Titania Hotel (52 Panepistimiou Avenue)

**ORGANIZING AND SCIENTIFIC COMMITTEE**

1. Dr. Gregory T. Papanikos, President, ATINER.
2. Dr. George Poulos, Vice-President of Research, ATINER & Emeritus Professor, University of South Africa, South Africa.
3. Dr. Nicholas Pappas, Vice-President of Academic Affairs, ATINER & Professor, Sam Houston University, USA.
4. Dr. Panagiotis Petratos, Vice-President of Information Communications Technology, ATINER & Fellow, Institution of Engineering and Technology & Professor, Department of Computer Information Systems, California State University, Stanislaus, USA.
5. Dr. Nicolas Abatzoglou, Head, Environment Research Unit, ATINER & Professor, Department of Chemical & Biotechnological Engineering, Université de Sherbrooke, Canada, Chair Pfizer, PAT in Pharmaceutical Engineering, Director GREEN-TPV and GRTP-C & P.
6. Dr. Tala Awada, Head, Agriculture Research Unit, ATINER & Professor, University of Nebraska, USA.
7. Dr. Konstantinos Giannakas, Professor, University of Nebraska-Lincoln, USA.
8. Dr. Emie Yiannaka, Associate Professor, University of Nebraska-Lincoln, USA.
9. Dr. Timothy Howe, Academic Member, Environment and Agriculture Research Unit of ATINER & Associate Professor of History and Ancient Studies, Saint Olaf College, USA.
10. Dr. John Hayes, Professor, Clemson University, USA.
11. Dr Amitava Rakshit, Faculty Member, Banaras Hindu University, Varanasi, UP, India.
12. Dr. Salah Mohammed Hassan Afifi, Professor, Assiut University, Egypt.
13. Dr. Salah Er-Raki, Professor, University of Cadi Ayyad, Morocco.
14. Dr. Iakovos Caravanos, Professor, Hunter College of the City University of New York, USA.
15. Dr. Keith Edmister, Professor, North Carolina University, USA.
16. Dr. Salazar Raquel, Professor-Researcher, Universidad Autónoma Chapingo, Mexico.
17. Dr. Alice Merab Kagoda, Associate Professor, Makerere University, Uganda.
18. Dr. Amit Sarin, Associate Professor, Amritsar College of Engineering and Technology, India.
19. Dr. Virginia Sisiopiku, Associate Professor, University of Alabama, USA
20. Ms. Ditika Kopliku, Associate Professor, University of Shkodra Luigj Gurakuqi, Albania.
21. Ms. Anila Mesi-Dizdari, Associate Professor, University of Shkodra Luigj Gurakuqi, Albania.
22. Dr. Reha Onur Azizoglu, Postdoctoral Research Associate, College of Veterinary Medicine, North Carolina State University, USA.
23. Dr. Romana Elzbieta Pawlinska-Chmara, Assistant Professor, Opole University, Poland.
24. Dr. Behzad Sani, Assistance Professor, Islamic Azad University, Iran.
25. Dr. Xiaodong Zhang, Postdoctoral Fellow, University of Texas at Austin, USA.
26. Ms. Olga Gkounta, Researcher, ATINER.

**Administration**

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

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

**Monday 14 July 2014**

**08:30-09:15 Registration**

**09:15-09:30 Welcome and Opening Remarks**

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

**09:30-11:00 Session I (Room C): Water Quantity and Quality**
**Chair:** Ms. Olga Gkounta, Researcher, ATINER.

1. Joo-Heon Lee, Professor, Joongbu University, South Korea. Climate Change Impact on Statistical Characteristics of Korean drought based on Multi GCM Outputs.
2. Hu Yang, Professor, Nanjing University, China. Novel Amphoteric Starch-Based Flocculants Can Flocculate Different Contaminants with even Opposite Surface Charges from Water through Molecular Structure Control.
3. *Amin Talei, Lecturer, Monash University Malaysia, Malaysia & Lloyd Hock Chye Chua, Assistant Professor, Nanyang Technological University, Singapore. Real Time Neural Fuzzy System for Runoff Forecasting.
4. Joseph Bassil, Ph.D. Student, University of Poitiers, France, Aude Naveuau, Lecturer, University of Poitiers, France, Pamela Di Tullo, University of Pau Pays, France, Laurent Grasset, Associate Professor, University of Poitiers, France, Jacques Bodin, Associate Professor, University of Poitiers, France, Moumtaz Razack, Professor, University of Poitiers, France & Veronique Kazpard, Professor, Lebanese University, Lebanon. Distribution and Speciation of Selenium in the Black Shale of the Dogger Aquifer in the Poitiers Experimental Hydrogeological Site.
5. Hanni Mehanna, Researcher, National Research Centre, Egypt. Validation of SALTMED Model under Different Conditions of Drought and N Fertilizer for Snap Bean.

**11:00-12:30 Session II (Room C): Terrestrial and Marine Ecology and Environmental Stresses**
**Chair:** *Amin Talei, Lecturer, Monash University Malaysia, Malaysia

1. Mina Hsu, Professor, National Sun Yat-sen University, Taiwan, Govindasamy Agoramoorthy, Professor, Tajen University, Yanpu, Taiwan, Jin-Fu Lin, Ph.D. Student, National Sun Yat-sen University, Taiwan, Mei-Yi Lin, Ph.D. student, National Sun Yat-sen University, Taiwan. Population Dynamics of Formosan Macaques at Mt. Longevity, Taiwan.
2. Wei Wei, Associate Professor, Research Center for Eco-Environmental Sciences, China. Ecosystem Services by Land Terracing: Environmental Significance and Problem Review.
3. *Ibrahim Belal, Assistant Professor, United Arab Emirates University, United Arab Emirates & Eihab Fathelrahman, Assistant Professor, United Arab Emirates University, United Arab Emirates. Aquaponic System Technical and Business Possibilities and Challenges in United Arab Emirates.
4. Ana Paunovic, Curator, Natural History Museum, Serbia, Smiljka Simic, Full Professor, Serbia & Georg Dzukic, Retired, Institute for Biological Research Sinisa Stankovic, Serbia. The Diet and of Eastern Spadefoot (Pelobates syriacus) in Macedonia. (Monday, 14 of July)

**12:30-14:00 Session III (Room C): Water, Climate and Society**
**Chair:** Constantine Hadjilambrinos, Associate Professor, University of New Mexico, USA.

1. Jorge Julian Velez Upegui, Professor, University National of Colombia Sede Manizales, Colombia. Environmental Assessment of Andean River Basins.
2. Maria Christina Fragkou, Assistant Professor, University of Chile, Chile. Seawater Desalination for Urban uses; a Metabolic Perspective for Studying its Potential Socio-Environmental Impacts.
3. Jr-Lin Lin, Researcher, National Chiao-Tung University, Taiwan, Analysis of Carbon Emission Hot Spot and Pumping Energy Efficiency in Water Supply System.
4. Abdelhafid Aimar, Associate Professor, University of Jijel, Algeria & Erabti Hana, Assistant Professor, University of Jijel, Algeria. Water Scarcity and Climate Change: The Search for an Optimal and Sustainable Management.

**14:00-15:00 Lunch (details during registration)**

**15:00-16:30 Session IV (Room C): Climate Change, Biodiversity and Energy**
**Chair:** *Ibrahim Belal, Assistant Professor, United Arab Emirates University, United Arab Emirates

1. Rafael Del Castillo, Professor, National Polytechnic Institute, Mexico & Sonia Trujillo Argueta, Professor, National Polytechnic Institute, Mexico. Climate Change in Mountainous Areas in Southern Mexico.
2. *Constantine Hadjilambrinos, Associate Professor, University of New Mexico, USA & Diane Thiel, Professor, University of New Mexico, USA. Shifting Gears as Well as Stepping on the Brake: An Integrated Approach to GHG Emission Reduction from Transportation.
3. Jorge Garcia Molinos, Researcher, Scottish Association for Marine Science, UK & Michael Burrows, Professor, Scottish Association for Marine Science, UK. Climate Velocity: Projecting Shifts in Species Distributions Under Future Climate Change.
4. Marek Zoladek, Ph.D. Student, Pedagogical University of Cracow, Poland. Modern Energy Sources in High Mountain Areas.
5. *Nita Rukminasari, Associate Professor, Hasanuddin University, Indonesia. Fossil Fuel Burning and CO2.

**16:30-18:00 Session V (Room C): Waste Water and Water Treatment**
**Chair:** *Nita Rukminasari, Associate Professor, Hasanuddin University, Indonesia

1. Chih-Chao Wu, Professor, Feng-Chia University, Taiwan, Hsien-Yi Tsai, Professor, Feng-Chia University, Taiwan, Chi-Chuan Kan, Professor, Feng-Chia University, Taiwan, Meng-Wei Wan, Professor, Feng-Chia University, Taiwan, Winn-Jang Huang, Professor, Feng-Chia University, Taiwan & Tin-Lai Lee, Professor, Feng-Chia University, Taiwan. Establishing Turbidity of Repined Diversity for Water and Waste Reducing in Backwash Operation for Rapid Filtration.
2. Chi-Chuan Kan, Associate Professor, Chia-Nan University of Pharmacy & Science, Taiwan. Study of Residual Aluminum Improvement in Drinking Water Treatment Plant.
3. Peiman Kianmehr, Assistant Professor, American University of Dubai, United Arab Emirates & Fadi Kfoury, Professor, American University of Dubai, United Arab Emirates. Application of Neural Networks to Estimate Methane Generation from Ozone-Pretreated Wastewater.
4. Fu Lung Wong, Researcher, City University of Hong Kong, Hong Kong. Nanomaterials-Based Sorbents for Oil Spill Cleanup in Water Environment.
5. Mohamed Brahim Errahmani, Teacher Researcher, Saad Dahlab University, Algeria, Mohand Said Hamaidi, Teacher Researcher, Saad Dahlab University, Algeria & Fella Hamaidi-Chergui, Teacher Researcher, Saad Dahlab University, Algeria. Monitoring over two-years of Water Quality Index (WQI) and Sodium Adsorption Ratio (SAR) of Boukourdane Dam Lake (Algeria).

**18:00-20:00 Session VI: Round Table Discussion on *Global Environmental and Anthropogenic Challenges to Agro and Natural Ecosystems***
**Chair:** Dr. George Poulos, Vice President of Research, ATINER & Emeritus Professor, University of South Africa, South Africa.

1. Dr. Constantine Hadjilambrinos, Associate Professor, University of New Mexico, USA.
2. Dr. Maria Christina Fragkou, Assistant Professor, University of Chile, Chile.
3. Mr. Spiro Adamopoulos, Chief Executive Office, Agricultural Levies Institute of Australia, Australia.
4. Arturo F. Castellanos-Ruelas, Professor and Researcher, Autonomous University of Yucatan, Mexico.
5. Marshaley Baquiano, Assistant Professor, University of the Philippines, Philippines.

**21:00–23:00 Greek Night (Details during registration)**

**Tuesday 15 July 2014**

**08:00-10:00 Session VII (Room C): Climate Change and Human Dimensions**
**Chair:** Zagabathuni Venkata Panchakshari Murthy, Professor/Head, Department of Chemical Engineering,S.V. National Institute of Technology, India

1. Ivo Ercole Rigamonti, Associate Professor, University of Milan, Italy, Luigi Mariani, Professor, University of Milan, Italy, Gabriele Cola, Professor, University of Milan, Italy & Johann Baumgartner, Professor, Center for the Analysis of Sustainable Agricultural Systems, Switzerland. Climate Change and Effects on the European Spread Pattern of Scaphoideus Titanus Ball.
2. *Eihab Fathelrahman, Assistant Professor, United Arab Emirates University, UAE, Ibrahim Belal, Assistant Professor, United Arab Emirates University, UAE & Saif S. Al-Qaydi, Professor, United Arab Emirates University, UAE. Climate Change Impacts and Adaptation Strategies for United Arab Emirates Fisheries Sector.
3. Ana Joy Mendez, Assistant Professor, University of Guam, USA. Social Representations on Climate Change: Guam Youth and Young Adults Perspectives. (Tuesday, 15 of July).
4. Bondan Supraptilah Sikoki, Senior Researcher, Survey Meter, Indonesia & Ni Wayan Suriastini, Senior Researcher, Survey Meter, Indonesia. Demographic Differential Vulnerability and Resilience to Natural Disasters in the Context of Climate Change Adaptation: Case Study from Mount Merapi Eruption in Indonesia.
5. Mozharul Islam, Ph.D. Student, Hacettepe University, Turkey. The Effect of Global Climate Change on the Coastal Areas of Bangladesh: The Identity Crisis of Environmentally Displaced People.
6. Bourhane-Eddine Belabed, Professor, University Badji Mokhtar Annaba, Algeria, Meddour Abderrafik, University Badji Mokhtar Annaba, Algeria & Lotfi Aleya, Franche University, France. Evaluation of the Level of Trace Metal Contamination (Zn, Cu, Pb, Cd, Hg) in the Sediment and Mugil Cephalus (Mugilidae) from the Coast of Annaba (Algeria).

**10:00-11:30 Session VIII (Room C): Waste Water and Water Treatment**
**Chair:** *Eihab Fathelrahman, Assistant Professor, United Arab Emirates University, UAE

1. Maria Socorro Espino Valdes, Professor, Autonomous University of Chihuahua, Mexico, Carmen Julia Navarro G., Professor, Autonomous University of Chihuahua, Mexico, Adan Pinales M., Professor, Autonomous University of Chihuahua, Mexico, Lourdes Villalba, Professor, Autonomous University of Chihuahua, Mexico, Rodrigo De la Garza A., Professor, Autonomous University of Chihuahua, Mexico & Humberto Silva H., Professor, Autonomous University of Chihuahua, Mexico. Nitrogen Removal from a Secondary Effluent by Sandy Soil Percolation.
2. Zagabathuni Venkata Panchakshari Murthy, Professor/Head, Department of Chemical Engineering,S.V. National Institute of Technology, India. Nickel Removal from Aqueous Solutions by Different Methods.
3. Shu-Ju Chao, Ph.D. Student, National Chiao Tung University, Taiwan, Yu-Chun Su, Assistant Researcher, National Chiao Tung University, Taiwan & Chihpin Huang, Professor, National Chiao Tung University, Taiwan. Toxicity Assessment of Semiconductor Wastewater Using Zebrafish Embryos.
4. Yousef Elgzeli, Assistant Professor, Eljabel Elgharbi University, Libya, Ahmed Ibrahim Ekhmaj, Libya & Abd-Alrahman A. A. Embaby, Libya. Hydrogeological and Hydrochemical Investigation of Coastal Aquifers – in the Jifarah Plain, Northwest of Libya – Crisis in Overexploitation and Salinization.

**11:30-13:00 Session IX (Room C): Terrestrial and Marine Ecology and Environmental Stresses**
**Chair:** Maria Socorro Espino Valdes, Professor, Autonomous University of Chihuahua, Mexico

1. Yihe Lv, Professor, Research Center for Eco-Environmental Sciences, China, Bojie Fu, Research Center for Eco-Environmental Sciences, China & Liwei Zhang, Research Center for Eco-Environmental Sciences, China. Recent Ecological Transition in China: Greening, Browning and the Influencing Factors.
2. Sombra Patricia Rivas Arancibia, Professor, Benemerita Autonomy University of Puebla, Mexico, Victor Hugo Minor Almazan, Student, Benemerita Autonomy University of Puebla, Mexico, Dulce Maria Figueroa Castro, Professor, Benemerita Autonomy University of Puebla, Mexico, Hortensia Carrillo Ruiz, Professor, Benemerita Autonomy University of Puebla, Mexico, Agustina Rosa Andres Hernandez, Professor, Benemerita Autonomy University of Puebla, Mexico. Heterotrophic Succession in Neobuxbaumia Tetetzo in an Arid Environment, in Central Mexico.
3. Zaki Moustafa, Principal Scientist, South Florida Water Management District, USA, Wasantha Lal, Principal Engineer, South Florida Water Management District, USA & Walter Wilcox, Section Leader, South Florida Water Management District, USA. Estimates of In-Situ Vegetation Resistance in Large Constructed Wetlands. (Tuesday 15 of July).
4. Salvador Arenas-Castro, Postdoctoral Researcher, Czech University, Czech Republic, Juan Fernandez-Haeger, Professor, University of Cordoba, Spain & Diego Jordano-Barbudo, Professor, University of Cordoba, Spain. Radial Growth Patterns and Age Variations in a Local Population of Pyrus bourgaeana D. in Sierra Morena (Spain).
5. Hossam Abbas, Deputy Head, Hydrobiology Department, National Research Centre, Egypt, Wagdy Khalil, Deputy Head, Cell Biology Department, National Research Centre, Egypt & Fagr Abdel-Gawad, Deputy Head, Water Pollution Department, National Research Centre, Egypt. Oxidative Stress and Genotoxicity

Biomarker Responses in Grouper (Epinephelus Aeneus) Fish from Suez Gulf, Egypt.

6. *Kasia A. Pawelek, Assistant Professor, University of South Carolina Beaufort, USA, Patrick Niehaus, Student, University of South Carolina Beaufort, USA, Cristian Salmeron, Student, University of South Carolina Beaufort, USA, Gregg J. Hunt, Director, Beaufort County Mosquito Control, USA & Elizabeth J. Hager, Deputy Director/ Biologist, Beaufort County Mosquito Control, USA. Modeling Dynamics of a Culex Quinquefasciatus Considering Impact of Climate Change, Natural Factors, and Assessing Control Strategies against the Spread of West Nile Virus.

**13:00-14:00 Lunch (Details during registration)**

**14:00-15:30 Session X (Room C): Plants Growth and Distribution under a Changing Climate**
**Chair:** Yihe Lv, Professor, Research Center for Eco-Environmental Sciences, China

1. Marshaley Baquiano, Assistant Professor, University of the Philippines, Philippines & Ana Joy Mendez, Assistant Professor, University of Guam, USA. Social Representations of Climate Change: a Cross- Cultural Investigation.
2. Michal Apollo, Ph.D. Student, Pedagogical University of Cracow, Poland & Suman S. Bhattarai, Associate Professor, Tribhuvan University, Nepal. Zoogenic Erosion. Livestock Impact on Vegetation and Land Relief Modeling in the Himalayan Miyar Valley (India).
3. Georgi Kadinov, Ph.D. Student, Forestry University, Bulgaria. Evaluation of Air Quality in the Rhodope Mountains and its Effect on Vegetation.
4. Khalid A. Al Mutairi, Assistant Professor, University of Tabuk, Kingdom of Saudi Arabia & Salman A. Al-Shami, University of Tabuk, Kingdom of Saudi Arabia. Spatial and Environmental Determinants of Plant Diversity in Farasan Archipelago, Saudi Arabia.

**15:30-17:00 Session XI (Room C): Advancements in Water Science**
**Chair:** Marshaley Baquiano, Assistant Professor, University of the Philippines, Philippines

1. David Ayala-Cabrera, Ph.D. Student, Polytechnic University of Valencia, Spain, Silvia J. Ocana-Levario, Ph.D. Student, Polytechnic University of Valencia, Spain, Joaquin Izquierdo, Professor, Polytechnic University of Valencia, Spain & Rafael Perez-Garcia, Professor, Polytechnic University of Valencia, Spain. Improving Water Supply System Components Visualization into GPR Images.
2. Abd Elhamed Khater, Ph.D. Student, Tottori University, Japan, Yoshinobu Kitamura, Specially Appointed Professor, Tottori University, Japan, Katsuyuki Shimizu, Associate Professor, Tottori University, Japan, Hiroaki Somura, Associate Professor, Shimane University, Japan & Waleed Hassan Abou El Hassan, Associate Professor, Water Management Research Institute, Egypt. Improving Water Quality in the Nile Delta Irrigation Network by Regulating Reuse of Agricultural Drainage Water.

**17:30-20:30 Urban Walk (Details during registration)**
**21:00-22:00 Dinner (Details during registration)**

**Wednesday 16 July 2014**
Cruise: (Details during registration)
**Thursday 17 July 2014**
Delphi Visit: (Details during registration)

**Hossam Abbas**
Deputy Head, Hydrobiology Department, National Research Centre, Egypt
**Wagdy Khalil**
Deputy Head, Cell Biology Department, National Research Centre, Egypt
&
**Fagr Abdel-Gawad**
Deputy Head, Water Pollution Department, National Research Centre, Egypt

# Oxidative Stress and Genotoxicity Biomarker Responses in Grouper (*Epinephelus Aeneus*) Fish from Suez Gulf, Egypt

Large discharges from oil and gas production platforms have led to concerns for adverse biological effects in marine areas. This study aimed to assess oxidative stress and genotoxicity biomarkers in Grouper; Epinephelus aeneus collected from several locations in Suez Gulf. Cellular antioxidant defenses, i.e., glutathione peroxidase and glutathione-S-transferase were used as biomarkers of oxidative stress. DNA fragmentation and micronucleus assays were used as indication of genetic toxicity. Influence of oil pollution stress on oxidative stress and genotoxicity biomarker responses in groupers collected from Suez oil production Port (Floating Port) and Atakah fishing Port in Suez Governorate was investigated. Gills and liver tissues of Groupers collected from the same locations of Suez Gulf were used to address the interaction between pollution status and cellular antioxidant defenses as well as genotoxicity biomarkers. The results revealed that fish collected from Floating Port showed decrease in the glutathione peroxidase and glutathione-S-transferase activities and increase the DNA fragmentation and micronuclei formation. However, fish samples collected from Atakah fishing Port revealed higher antioxidant enzyme activities and lower DNA fragmentation and micronuclei formation compared to those collected from Floating Port. Correlations between biomarkers suggest that observed effects were due to contaminants exhibiting oxidative stress potential that can also induce genotoxicity. Results suggest that the selected biomarkers in Grouper are useful for the assessment of pollution impacts in Suez Gulf environments influenced by multiple pollution sources.

**Abdelhafid Aimar**
Associate Professor, University of Jijel, Algeria
&
**Erabti Hana**
Assistant Professor, University of Jijel, Algeria

# Water Scarcity and Climate Change: The Search for an Optimal and Sustainable Management

Since the turn of the 20th century water scarcity and climate change has become a major global issue of paramount importance as it affects national economies, human and animal lives and the environment. Growing demand for diminishing water resources and extreme climate events are posing serious challenges to governments worldwide in terms of sustainable development, food security and national stability. Population growth, rapid urbanization, rainfall patterns, soil humidity, water-related disasters like floods and droughts are significantly impacting production and threatening human security. Some regions are already suffering water shortages and others are lacking clean drinking water. Excessive and careless use and wastage of water, pollution and salination constitute serious threats to scarce water resources and deteriorate the quality of water in a considerable number of countries. Unless individuals change the ways water is used and governments and all parties concerned improve water management, many regions will be facing a serious water crisis. This paper raises and analyses a number of issues with the aim of reaching a better understanding of water scarcity problems in the context of climate changes. It seeks to suggest effective ways to face water scarcity and to deal with future risks of climate change. It sheds light on prominent cases and emphasizes the need for local, regional and international cooperation and coordination to cope with climate changes, sustain scarce water resources and raise water–use efficiency.

**Khalid A. Al Mutairi**
Assistant Professor, University of Tabuk, Kingdom of Saudi Arabia
&
**Salman A. Al-Shami**
University of Tabuk, Kingdom of Saudi Arabia

# Spatial and Environmental Determinants of Plant Diversity in Farasan Archipelago, Saudi Arabia

The present study aimed at investigating the effects of spatial and environmental factors on plant species richness in Farasan Archipelago, Saudi Aarbia. The principal coordinates of neighbor matrices (PCNM) technique was used to identify the spatial variables (PCNM vectors). The PCNM produced 9 eigenvectors and only two vectors were positive and significant based on the forward selection procedures. Similar forward selection technique, based on the two stopping criteria, was also employed to determine the most important environmental variables controlling the plant species richness. Among the 13 environmental variables investigated, only 6 variables were retained after forward selection that controlling species richness in Farasan Archipelago. These selected parameters, arranged according to their importance, were altitude, electrical conductivity (EC), calcium (Ca), sodium (Na), calcium carbonate ($CaCO_3$) and organic matter (OM). The variation partitioning technique was employed to examine the relative importance of environmental and spatial factors to the plant species richness. The selected environmental parameters (altitude, EC, Ca, Na, $CaCO_3$ and OM explained 26.3% of the total variance in species richness. However, the two selected spatial variables (PCNM vectors) explained only 4.2% of the richness variation. On the other hand, the spatially-structured environmental variables (shared fraction) explained 5.6 % of the total variance in plant species richness. The present study revealed that the environmental variables (altitude and soil chemistry) are the most important factors regulating the species richness in Farasan Archipelago. However, the spatial variables showed to be less important in shaping the diversity patterns of plants in Farasan Archipelago. [Al Mutairi K., Al-Shami S. Spatial and Environmental determinants of plant diversity in Farasan Archipelago, Saudi Arabia

**Michal Apollo**
PhD Student, Pedagogical University of Cracow, Poland
&
**Suman S. Bhattarai**
Associate Professor, Tribhuvan University, Nepal

# Zoogenic Erosion. Livestock Impact on Vegetation and Land Relief Modeling in the Himalayan Miyar Valley (India)

Animals are a significant geomorphologic factor, influencing the processes of terrain morphology such as denudation and/or erosion. However, their influence is often omitted, or has no significant description related with the land relief development. It happens like this because their influence is less spectacular than the wind and/or water activity or temperature.

This paper focuses mainly on livestock (yaks, cattle, sheep, goats) which affects the terrain in two ways: directly – by shredding and then movement of soil on the surface of the slopes (horizontal displacement), and indirectly – by destruction of vegetation and then soil erosion by water, wind and mechanical denudation (preparation for ground degradation).

The results of 14 research areas clearly indicate that their impact is often underestimated. Chosen areas were divided into three groups: (1) describing the changes in vegetation, (2) indicating the scale of the development and modelling of the slope, and (3) areas cut off from animals – as a comparison site. In the period of four weeks on the areas from the first group (1) nearly 20% decline (trodden, grazing) in the number of plants was recorded, and also paths width increased by 6%. On the second group of areas (2) where erosion pins were used, soil level has changed, uncovering the pins by 3.6 mm up to 18.9 mm depending on the slope of the ground. At the same period of time on comparison areas (3) the erosion pins were uncovered only up to maximum 1.7mm (vertical position).

Summary of results shows the scale of the phenomenon which is the zoogenic erosion.

**Salvador Arenas-Castro**
Postdoctoral Researcher, Czech University of Life Sciences, Czech Republic
**Juan Fernandez-Haeger**
Professor, University of Cordoba, Spain
&
**Diego Jordano-Barbudo**
Professor, University of Cordoba, Spain

# Radial Growth Patterns and Age Variations in a Local Population of *Pyrus bourgaeana* D. in Sierra Morena (Spain)

*Pyrus bourgaeana* D. is one of four species of wild pears present in Spain and is endemic of the Iberian peninsula. Iberian wild pear trees provide palatable leaves and fleshy fruits which are used by a wide variety of mammals and birds during the summer drought when food and water are very scarce. Thus, this species plays an important trophic role in the ecosystem and could be considered a "keystone species". However, very little is known about its biology and ecology. Dendrochronological techniques were used to study age structure and lifetime growth patterns in a population of P. *bourgaeana* in Sierra Morena (Spain) and their variation between two adjacent habitats, open woodland dominated by Holm oak (*Quercus ilex*) and an abandoned olive grove (*Olea europaea*). The age of the oldest individual was 76 years, and there was a large variation in size among trees. However, age was relatively poorly correlated with trunk diameter ($r=0.58$, $p<0.001$, $n=122$) which was not a good predictor of age ($y=0.9638+0.4487x$, $R2=0.34$). Growth of trees measured as mean annual ring increment was significantly higher in the abandoned olive grove than in the open woodland (*Kruskal-Wallis* test, $H = 17.53500$; g.l. = 1; $p < 0.001$; $n=70$), even when only trees belonging to the same cohort were compared. Differences on mean annual increment of basal area were also significantly higher in the abandoned olive grove that in the open woodland (*Kruskal-Wallis* test, $H = 50.75145$; g.l. = 1; $p < 0.001$; $n=70$). Our results show that even neighbor trees with similar ages and sizes show different rates and patterns of growth, and these differences were not attributable to either the density or the cover of other neighbor trees.

**David Ayala-Cabrera**
PhD student, Polytechnic University of Valencia, Spain
**Silvia J. Ocana-Levario**
PhD student, Polytechnic University of Valencia, Spain
**Joaquin Izquierdo**
Professor, Polytechnic University of Valencia, Spain
&
**Rafael Perez-Garcia**
Professor, Polytechnic University of Valencia, Spain

# Improving Water Supply System Components Visualization into GPR Images

Currently, technology inclusion into civil engineering fields, such as water supply systems (WSS), is a challenge for researchers, and utility managers. Data obtained after the inclusion of certain technologies should improve decision-making processes about the actions to propose for the assets of those systems. In this sense, non-destructive methods have shown to be interesting techniques that support network components assessment without affecting the surrounding environmental conditions. However, the huge size and the difficulty of interpretation of the obtained information, together with continuous network growth (population increase), maintenance activities, etc., greatly impair the power of these tools. These aspects constitute the main reasons for some technologies not to have been included efficiently in WSS management so far. In this paper, ground penetrating radar (GPR) is used as a non-destructive method to assess the components of WSSs. The aim is the detection of various pipe materials (such as plastic and metallic, among others), and the identification of some important characteristics (e.g. water leakage). This work focuses on improving the visualization of WSS components into images captured using GPR. This seeks to encourage direct identification of these components in GPR images by personnel non-highly skillful in the interpretation of data from non-destructive techniques, and to promote the design of automatic detection algorithms. This last aspect enables the integration of augmented reality techniques into the systems, which will support decision-making activities (regarding maintenance and rehabilitation, among others). This will represent a step forward to the Smart Cities approach, which includes autonomous management of WSSs, thus jointly benefiting utilities and citizens. The proposed work is achieved through GPR surveys of configuration of different pipe materials, which are analyzed using data mining approaches. Results and analyses are presented in this paper.

**Joseph Bassil**
PhD Student, University of Poitiers, France
**Aude Naveuau**
Lecturer, University of Poitiers, France
**Pamela Di Tullo**
University of Pau and Pays de l'Adour, France
**Laurent Grasset**
Associate Professor, University of Poitiers, France
**Jacques Bodin**
Associate Professor, University of Poitiers, France
**Moumtaz Razack**
Professor, University of Poitiers, France
&
**Veronique Kazpard**
Professor, Lebanese University, Lebanon

# Distribution and Speciation of Selenium in the Black Shale of the Dogger Aquifer in the Poitiers Experimental Hydrogeological Site

Selenium (Se) is an element having the narrowest range between dietary deficiency and toxic concentrations. In the environment, selenium has four oxidation states (-II, 0, IV and VI) and has a complex biogeochemical cycle. The European and French legislations fixed 10µg/L as safe upper limit in drinking water. In several French regions, selenium concentrations above the limit were detected in groundwater. This poses a problem for local authorities which are obliged to stop the exploitation of many wells.

In the north flank of the "Seuil du Poitou", Selenium concentrations above 10 ppb were measured in groundwater samples collected from five wells of the Poitiers Experimental Hydrogeological Site (SEH), which investigates a 100 m carbonate aquifer (Dogger). Total rock analysis applied on samples representing all the geological facies observed in the SEH show that selenium is concentrated in the black clays that fulfill some karst cavities; these clays are thought considered as the main selenium source in the Dogger Aquifer.

The main objective of this work is to study the distribution and the speciation of selenium in the geological matrix and the release mechanisms of Se in order to provide quantifiable data to numerical modeling of selenium's reactive flows across the aquifer. The distribution and the speciation of selenium in these black clays were studied by applying parallel and sequential chemical extractions and by verifying the impact of these extractions on the solid dissolution and

organic matter mobilization. In all the extractions, the total dissolved selenium was quantified using ICP-MS and the selenium speciation in the aqueous phase by HPLC-ICP-MS. Verifying the impact of the extractions on the solid dissolution and on the organic matter mobilization was performed by measuring Al, Si, Fe and Ca by AAS and the Total Organic Carbon TOC and by acquisition of XRD diffractograms of the solid residues. Our results showed that most of the selenium is majorly associated with the soluble humic-like organic matter. 40% of extracted selenium identified as Se (IV), which was rarely observed in the literature and suggests that the Se in the black clays may be easily solubilized.

**Marshaley Baquiano**
Assistant Professor, University of the Philippines, Philippines
&
**Ana Joy Mendez**
Assistant Professor, University of Guam, USA

# Social Representations of Climate Change: A Cross-Cultural Investigation

The study looked at college students' meaning-making of climate change, using the lens of Social Representation Theory. Participants were 543 undergraduate students who were asked to answer a free association questionnaire in which they were to write the first three ideas that came to their mind at the thought of climate change. Abric's (2008) hierarchical evocation method was used in analyzing the data. Central to the understanding of students is that climate change is a plain modification in the patterns of weather, climate, season, temperature, and environment, and that it is very much associated with global warning. Peripheral elements include calamities and disasters, environmental destruction, incomprehensible weather, social impacts of climate change, as well as environmental abuses. Results have implications on the development and implementation of policies and strategies on climate change mitigation and adaptation.

**Bourhane-Eddine Belabed**
Professor, University Badji Mokhtar Annaba, Algeria
**Meddour Abderrafik**
University Badji Mokhtar Annaba, Algeria
**&**
**Lotfi Aleya**
University of Franche-Comte, France

# Evaluation of the Level of Trace Metal Contamination (Zn, Cu, Pb, Cd, Hg) in the Sediment and Mugil Cephalus (Mugilidae) from the Coast of Annaba (Algeria)

Coastal areas are under the direct influence of wadis and wastewaters from which transit drainage basin waters as well as urban, agricultural and industrial wastewaters. When the renewal of water masses is smaller than the discharge quantities, these disposals lead to significant degradation of water quality and marine ecosystems. The aim of this study is to estimate the levels of heavy metals contamination in marine waters particularly the enrichment of sediment with Lead and Cadmium, and to identify the origin of pollution as well as the evaluation of the potential impact of heavy metal pollution from the city of Annaba on the eastern coast of Algeria. Measurements of trace metals (Zinc, Copper, Lead, Cadmium and Mercury) through atomic absorption spectrophotometer, were performed on the surface sediments and the flesh of a fish Mugil cephalus (Mugilidae) supplemented by analysis of granulation size and Total Organic Carbon (TOC) from samples collected in the sediments within five stations along the entire coast of Annaba and a sixth reference station located far from any source of waste release. Results interpretation, supported by calculation of index contamination and statistical analysis tools, enabled to identify the origin of trace metals that enriched the surface sediments and the fish tissue. This work confirms a state of a generalized pollution by trace metals including lead, which displays a disturbing degree of contamination, and significant differences between the sampled stations. These results involve the human activity as a source of pollution of the surface sediments with Lead and validate the use of the fish Mugil cephalus as a marine organism for biomonitoring.

**Ibrahim Belal**
Assistant Professor, United Arab Emirates University, UAE
&
**Eihab Fathelrahman**
Assistant Professor, United Arab Emirates University, UAE

# Climate Change Impacts and Adaptation Strategies for United Arab Emirates Fisheries Sector

United Arab Emirates witnessed decline of per capita fish supply/availability due to decreased of fishing stock. Fish represents a major diet in the country. Declining fish supply challenges the food security in the country. The research goal is to study impacts of climate change on United Arab Emirates (UAE) fisheries sector and investigate possible alternatives climate change adaptation strategies that are technically sound, socially sustainable, and economically feasible in the country. The research considered three selected climate change scenarios (wet, dry, and based scenarios), use climate and non-climate interaction matrix, and describe possible appropriate Geographic Information System (GIS) and Satellite imagery as a framework to analyze the research problem. Three climatic scenarios were considered for this Research 1) future projection base scenario of precipitation, 2) wet scenario, and 3) dry scenario. The research considered the interaction between climatic variable (temperature and sea level rise) on one hand the non-climatic variables such as over-fishing and habitat and coastal line modifications on the other hand, when building the research scenarios and hypothesis. The research used advance Geographic Information System and Satellite base information and database which introduce new type of data for researchers to explore and use for the purposes of research. Research carried out field survey at Khor Fakan and Diba Al-Hosson areas to validate computer spatial dimension and gather information on the fishermen ability to adapt to climate changes scenarios. Research results indicated the importance of both physical and soft infrastructure to enable vulnerable fisheries in UAE to adapt to climate change. The research described measures such as increasing dikes, drainage, and early warning systems are critical components to adapt to foreseen climatic changes. This research beneficiaries include the climate change and fisheries research community in UAE, policy and decision makers, and fisheries communities' organizations.

.

**Mohamed Brahim Errahmani**
Teacher researcher, Saad Dahlab University, Algeria
**Mohand Said Hamaidi**
Teacher researcher, Saad Dahlab University, Algeria
&
**Fella Hamaidi-Chergui**
Teacher researcher, Saad Dahlab University, Algeria

# Monitoring over Two-Years of Water Quality Index (WQI) and Sodium Adsorption Ratio (SAR) of Boukourdane Dam Lake (Algeria)

The present work aims at assessing the water quality index (WQI) in the surface water of Boukourdane Dam Lake located in the North-West of Mitidja near Tipaza (36°32'03''N 02°18'18''E) by monitoring three sampling locations for a two-years period (April 2005-March 2007). The surface water samples were subjected to comprehensive physico-chemical analysis involving major cations ($Ca^{2+}$, $Na^{+}$ and $Mg^{2+}$), anions ($Cl^{-}$, $SO_4^{2-}$, $NO_3^{-}$, $PO_4^{3-}$) besides general parameters : Temperature (T), pH, electrical conductivity (EC), organic matter, dissolved oxygen (DO), chemical and biological oxygen demand (COD and BOD). Some not very strong but significant correlations were highlighted in particular groups (fig 1 and 2). The WQI [1] which can be considered as a reliable indicator for classification of surface water [2] and can be used to look at trends over time on a single site [3] have been calculated using 11 parameters namely T, pH, DO, electrical conductivity EC, nitrates, nitrites, ammonium, phosphates, total suspended solids (TSS), COD and BOD. The reported values have shown that the Boukourdane water belongs to good water (Fig 3) class with WQI values ranging between 70 and 90. One time in February 2006, the WQI had fallen under 70, indicating a poor water category, probably not totally safe for human consumption.

The excess of sodium in irrigation waters can perturb soil properties and reduce its fertility [4]. The sodium adsorption ratio (SAR) which was calculated [5] using the three cations [$Na^{+}$], [$Ca^{2+}$] and

[$Mg^{2+}$] is an important ratio indicating the effects of irrigation waters on soils. Levels found during this experiment indicated that Boukourdane lake waters were of medium salinity and low sodium hazard for 4 months (Fig 4) which means water suitable for irrigation without particular danger (Fig 5). However they were for 7 months with high salinity and low sodium hazard, thus, precautions were required in soils with restricted drainage.

**Figure 1 and 2**. *Correlated Remarkable Groupings and linked to "Spring-summer" and "Autumn-winter" Periods*

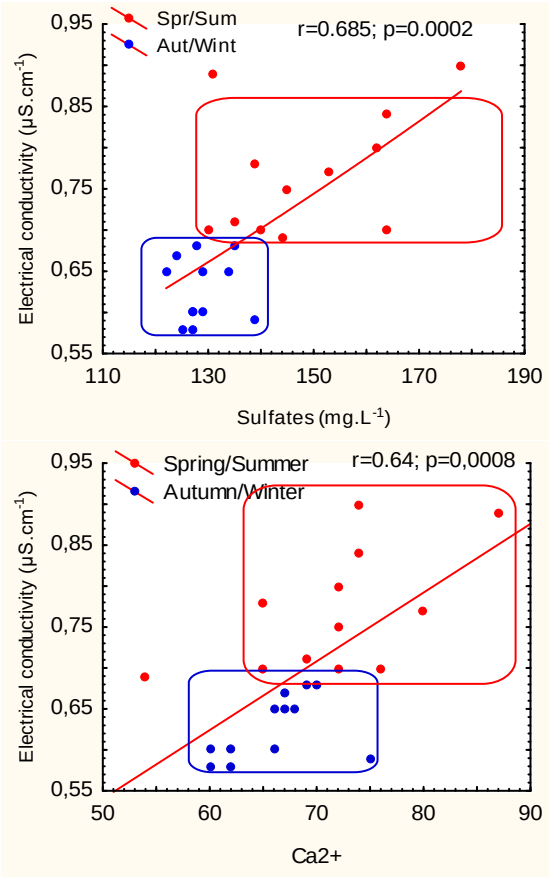



**Figure 3.** *Water Quality Index (WQI) over Two Years of Experiment*

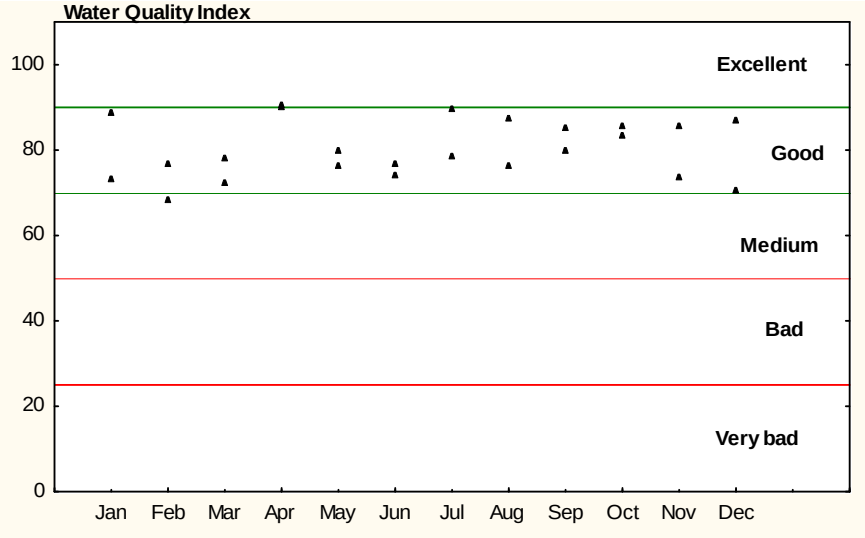

Water Quality Index
100
80
60
40
20
0
Excellent
Good
Medium
Bad
Very bad
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

**Figure 4.** *Quality of Water in Relation To Salinity and Sodium for 14 Months between April 2006 and September 2007*

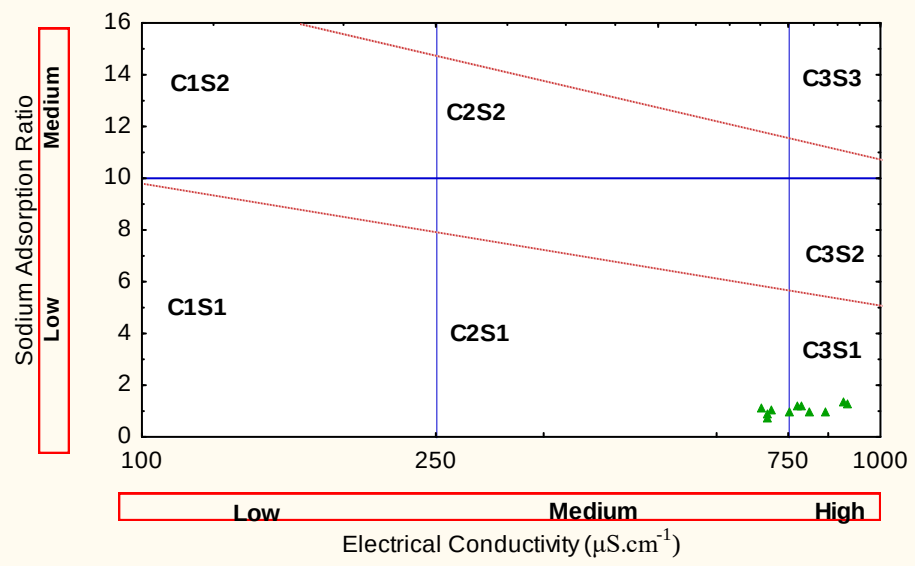
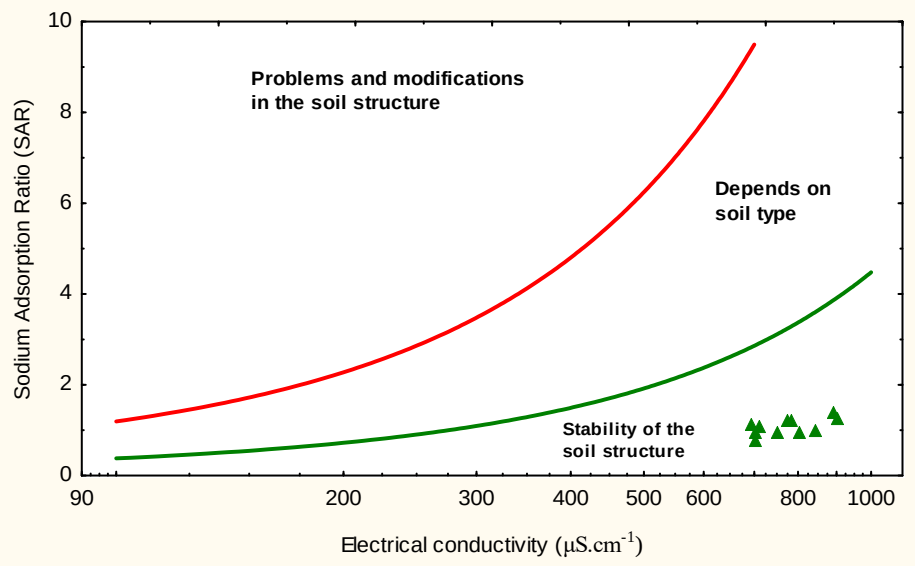



**Figure 5.** *Relationship between the Sodium Adsorption Ratio (SAR) and the Electrical Conductivity (EC) of Irrigation Waters for Prediction of Soil Structure Stability from April 2005 to September 2006.*



**Shu-Ju Chao**
PhD Student, National Chiao Tung University, Taiwan
**Yu-Chun Su**
Assistant Researcher, National Chiao Tung University, Taiwan
&
**Chihpin Huang**
Professor, National Chiao Tung University, Taiwan

# Toxicity Assessment of Semiconductor Wastewater Using Zebrafish Embryos

In semiconductor manufacturing processes nitrogenous substances are extensively used, resulting in production of very high nitrogen-containing wastewater. The high concentration of nitrogen-containing wastewater discharged to aquatic environment may cause eutrophication and toxicity. Although environmental regulations have become more stringent, they are not sufficient to tell us if the discharge is toxic or not. Therefore, many countries are using animals to detect the toxicity of wastewater. Traditional toxicity tests usually use mortality as endpoint, but the sensitivity of this method is not adequate for low concentration pollutants. Zebrafish embryo assay has been regarded as a suitable alternative to the fish acute toxicity test which, apart from ethical reasons, provides very limited data (only $LC_{50}$) and no ecotoxicological relevance. Due to transparency and extra-uterine development, zebrafish embryos can be directly observed the phenotypic changes during embryonic development. As a result, in this study zebrafish embryos were used to evaluate the toxicity and teratogenicity in nitrogen-containing wastewater. The purpose of this study is to examine the acute toxicity and developmental abnormalities in synthetic and real wastewater by using zebrafish embryos.

The results show the 96h-$LC_{50}$ of ammonium chloride, sodium nitrate and tetramethylammonium hydroxide were 111 mg $NH_3$-N/L, 1347.3 mg $NO_3$--N/L and 68 mg N/L, respectively; the low observed effect concentration were 0.41 mg $NH_3$-N/L, 0.51 mg $NO_3$--N/L and 0.1 mg N/L, respectively. The endpoints such as hatching rate, heart rate and body length significantly declined in these three nitrogenous solutions. Abnormalities including spinal curvature, pericardial edema and yolk sac edema were also observed in sequence in zebrafish larvae.

In real wastewater, the HF/CMP wastewater, acid-base wastewater and effluent from a semiconductor manufacturing factory were used. The mortality of zebrafish embryos in the acid-base wastewater and effluent was under 20% and 77% in HF/CMP wastewater in 96 hours. Although the mortality was low in the acid-base wastewater and

effluent, the cumulative hatching rate, body length and especially heartbeat significantly decline. Abnormalities including spinal curvature, pericardial edema and yolk sac edema were also observed in real wastewater tests. The results indicate that the zebrafish embryos can be instrumental to detect the potential harm caused by wastewater on aquatic organisms at low concentrations. It suggests that embryo toxicity assay should be used to evaluate the toxicity of wastewater in the future.

**Rafael Del Castillo**
Professor, National Polytechnic Institute, Mexico
&
**Sonia Trujillo Argueta**
Professor, National Polytechnic Institute, Mexico

# Climate Change in Mountainous Areas in Southern Mexico

Of all natural systems, the biota is probably the most affected by climate change. Recent studies have shown range shifts towards the poles for a broad range of species in agreement with global warming projections. However, for many species of tropical mountains reaching colder latitudes involves crossing vast warmer and drier areas than their actual habitats, making this possibility unlikely. Mountainous areas in southern Mexico, considered biodiversity hot spots and endemic species reservoirs, are an example. We conducted multidisciplinary studies to explore the effects and consequences of climate change in this region. Most climate change models project a warmer and drier climate, suggesting that current climatic conditions will be located at higher altitudes, posing higher risks for high-altitude species. We found different risks among macroscopic fungi: fleshy fruiting body species tend to be more vulnerable to global changes as they are more abundant and diverse at higher and humid altitudes than woody fungi. This risk is likely to be harsher in dry gradients. In these gradients, woody plant species biomass increases towards higher altitudes. Contrastingly, shrub species diversity and biomass tend to decrease. Thus, the replacement of tall and dense vegetation by short and sparse vegetation is expected, implying an overall decrease in carbon fixation, lower rates of water infiltration, and higher rates of soil erosion. Low rates of recent recruitment in the forest at a broad range of elevations are consistent with recent dry years. However, some epiphyte plants have maintained a positive population growth rate and high genetic diversity in spite of a continuous decline of its host trees. Our results show that tropical mountains are sites of high vulnerability to climate change for both ecosystemic services and biodiversity in particular at high-elevation sites. However, the response to climate change is likely to be species-specific.

**Yousef Elgzeli**
Assistant Professor, Eljabel Elgharbi University, Libya
**Ahmed Ibrahim Ekhmaj**
Libya
&
**Abd-Alrahman A. A. Embaby**
Libya

# Hydrogeological and Hydrochemical Investigation of Coastal Aquifers – in the Jifarah Plain, Northwest of Libya – Crisis in Overexploitation and Salinization

Libya as many other regions under arid climates suffer from inadequate water resources to cover all the needs of this rapidly developing country. Increasing water amounts for population supply, agricultural irrigation and use for industry are needed. As groundwater is the main water source in the country it represents a natural resource of the highest economic and social importance. FEFLOW numerical model was implemented in a regional scale to show how the natural situation has been changed after heavy groundwater abstraction having occurred in the last decades in the northwestern part of Libya. Results of the numerical model indicated that the current zones of depression in piezometric surface could have been caused by smaller withdrawn amounts than previously estimated. Indicated differences in assessed withdrawn groundwater volumes seem to be quite high and might influence considerably the future possibilities of groundwater use in the study region.

**Maria Socorro Espino Valdes**
Professor, Autonomous University of Chihuahua, Mexico
**Carmen Julia Navarro G.**
Professor, Autonomous University of Chihuahua, Mexico
**Adan Pinales M.**
Professor, Autonomous University of Chihuahua, Mexico
**Lourdes Villalba**
Professor, Autonomous University of Chihuahua, Mexico
**Rodrigo De la Garza A.**
Professor, Autonomous University of Chihuahua, Mexico
&
**Humberto Silva H.**
Professor, Autonomous University of Chihuahua, Mexico

# Nitrogen Removal from a Secondary Effluent by Sandy Soil Percolation

Nitrogen is a required nutrient by all living beings. However, nitrate, the most soluble form of nitrogen, may pollute groundwater used for human consumption; in high concentrations, it is responsible for causing child methemoglobinemia. Nitrogen in groundwater may result from sewage disposal systems, livestock facilities and fertilized cropland. Other possible sources are effluents from sewage secondary treatment plants which are used for green area irrigation. There are several physical-chemical nitrogen-removal techniques, but biological treatment process is used most commonly. With this method, organic nitrogen and ammonia are converted into nitrate in an aerobic environment by means of biological nitrification. Posterior removal of nitrate is reached by anaerobic denitrification, converting it to various gaseous forms of nitrogen.

Chihuahua City is located in the Mexican Republic, in an arid region with very scarce hydrological resources. The drinking water supply is covered by groundwater coming from several overexploited aquifers. To alleviate the water scarcity problem in the city, wastewater is being treated in a conventional activated sludge system, and reclaimed water is reused in green area irrigation. In the treatment, organic matter and suspended solids are efficiently removed; however, dissolved solids, including nitrogen in different forms, remain in the effluent. Given the possibility that nitrogen present in the treated water used in gardens could represent a risk of groundwater contamination, a pilot study in experimental systems packed with sand (ESPS) was done, reproducing the conditions of grass irrigation with reclaimed water in Chihuahua's gardens and studying its behavior during infiltration.

Removal of ammonia nitrogen, nitrite, nitrate and remnant organic matter was evident in the ESPS, presumably through volatilization of ammonia and combined biological nitrification and denitrification. These results showed that irrigation with the secondary effluent on sandy soils of Chihuahua's gardens doesn't represent a risk of underlying aquifer contamination.

**Eihab Fathelrahman**
Assistant Professor, United Arab Emirates University, UAE
&
**Ibrahim Belal**
Assistant Professor, United Arab Emirates University, UAE

# Climate Change Impacts and Adaptation Strategies for United Arab Emirates Fisheries Sector

United Arab Emirates government offers and support business opportunities for small and medium size entrepreneurships to explore and expand projects that are relevant to addressing the country's food security challenges. However, the government goal is to support the development of projects that can succeed and become sustainable under conditions of scarce natural resources (e.g. lack of both usable water and fertile land). A fully integrated fish and plants system that is capital intensive, labor saving, and environment friendly is described in this research. The system is suitable for United Arab Emirates scarce natural resources conditions. The research describes the advantages of the fish-vegetables integrated system based on several on-site experiments results. These experiments were conducted at the United Arab Emirates University, College of Food and Agriculture Laboratories and the College's experimental farm. Business indicators such as Benefit-Cost (BC) ratio, Internal Rate of Return (IRR), and Pay-Back Period (PBP) for each of the aquaculture, hydroponic, and the proposed integrated system are tabulated to illustrate the business possibilities under various operational scales, inputs and output prices and discount rate ranges. Both technical and business challenges of each of the three systems are discussed to uncover the relative advantages and disadvantages of the integrated system. The research also discussed the importance of government support for research and development of the proposed system, benefits of technical training, and the environmental challenges that may face small and mid-size Aquaponic system owners. Research results indicated that the integrated system is far superior to each of the hydroponic and aquaculture alone from technical, biological, business, and environmental perspectives if the Aquaponic systems would widely be adopted in the United Arab Emirates.

**Maria Christina Fragkou**
Assistant Professor, University of Chile, Chile

# Seawater Desalination for Urban Uses; a Metabolic Perspective for Studying its Potential Socio-Environmental Impacts

The alarming on-going and anticipated climate extremes that are expected to affect the global hydrologic cycle, combined with an unprecedented urbanisation rate that puts stress on existing water resources, causes scarcity even in areas once abundant in water resources. In this context, desalinated seawater has been gaining relevance as an alternative freshwater source in many urban areas that face physical or constructed water scarcity. The economic implications and environmental impacts of desalination, such as the effects of brine discharge on marine ecosystems, high energy demands and subsequent $CO_2$ emissions, have been studied in depth and are well documented. Nonetheless, there is a series of indirect socio-environmental impacts that international literature has paid little attention to and has done so principally through theoretical models and approaches. The present work proposes a conceptual and methodological approach that permits to identify and analyse these indirect impacts, based on two assumptions. First, the perception of seawater as an endless resource stimulates the creation of new urban water uses and diminishes conservation efforts, resulting in the transformation of physical water scarcity into socially constructed scarcity. Second, different social groups do not have the same capacity to react before service drawbacks, including price increases, quality concerns and incidents of service discontinuity, a fact that generates uneven social impacts. Urban water metabolism is employed as a conceptual and methodological tool, as a means to identify, quantify and interpret the consequences of the introduction of desalinated water in a city's metabolic processes. The use of annual metabolic indicators on water consumption and distribution network efficiency is expected to confirm the generation of the impacts supposed here.

**Jorge Garcia Molinos**
Researcher, Scottish Association for Marine Science, UK
&
**Michael T. Burrows**
Professor, Scottish Association for Marine Science, UK

# Climate Velocity: Projecting Shifts in Species Distributions under Future Climate Change

The reorganisation of patterns of species diversity driven by anthropogenic climate change, and the consequences for humans, are not yet fully understood or appreciated. Here we introduce a newly developed method based on the velocity of climate change to derive spatial trajectories along which climatic niches shifted from 1960 to 2006 and may shift up to 2100. The collective properties of trajectories are used to classify land and ocean areas with distinct consequences for climate migrants. Coastlines act as barriers and locally cooler areas act as attractors, influencing the flow of trajectories and creating distinct climate source and sink areas for species climate niches. Climate source areas indicate regions where developing climate conditions are disconnected from areas where similar climates previously occurred, thereby inaccessible to climate migrants tracking their thermal niches (16% of global surface area for 1960 to 2009 rising to 34% in the ocean for the RCP8.5 "business as usual" climate scenario). Climate sink areas, prevalent on coasts and high ground, signal where climate conditions locally disappear, potentially blocking movements of climate migrants, make up 3.6% of land and 1.0% of ocean area. Our analyses give global and regional maps of the expected directions and rates of shift in species distributions combined with effects of geographical barriers to climate migrants. We apply this methodology to identify potential biodiversity hotspots in the global ocean by examining the projected (2006-2100) spatial aggregation of climate niches for over 12,000 marine species based on their current distribution ranges under different climate change scenarios.

**Constantine Hadjilambrinos**
Associate Professor, University of New Mexico, USA
&
**Diane Thiel**
Professor, University of New Mexico, USA

# Shifting Gears as Well as Stepping on the Brake: An Integrated Approach to GHG Emission Reduction from Transportation

Greenhouse gas emissions from transportation are a large component, currently comprising over a quarter of all emissions from energy consumption. More alarmingly, they are increasing at a faster pace than overall greenhouse gas emissions and have proven to be very difficult to control. Gains made primarily through fuel efficiency improvements and secondarily through pricing policies, have been overwhelmed by increasing demand for transportation services, especially from newly industrialized countries such as China and India. This paper discusses the limitations of the current approaches to control emissions from transportation and develops an alternative approach that is based on concepts of socio-technical systemic transitions. By re-drawing the boundaries of what is considered the "transportation system" so as to broaden and integrate it to a more cohesive and nuanced concept of an energy services system, new opportunities for GHG mitigation practices can be identified.

**Minna J. Hsu**
Professor, National Sun Yat-sen University, Taiwan
**Govindasamy Agoramoorthy**
Professor, Tajen University, Taiwan
**Jin-Fu Lin**
PhD student, National Sun Yat-sen University, Taiwan
&
**Mei-Yi Lin**
PhD student, National Sun Yat-sen University, Taiwan

# Population Dynamics of Formosan Macaques at Mt. Longevity, Taiwan

Among the 21 extant species in the genus *Macaca*, the Formosan macaque (*Macaca cyclopis*) is endemic to the island of Taiwan. Although field researches of Formosan macaques are on-going over the last two decades, data on the mechanism of troop and matrilineal size on female rank and reproductive success are totally lacking. This study investigated the population dynamics, reproduction and survival of Formosan macaques at Mt. Longevity of Kaohsiung, Taiwan. We have monitored three social troops (A, B and C) since December 1995. Seven successful fissions occurred and most of them (71.4%) between November and February (mating season); only two fissions occurred in April and May. The dominant rank among adult females within a social troop of Formosan macaques was a linear relationship. Adult females from low-ranking matrilineal lines formed those branch troops. The average troop size was 46.9 (± 16.5) for 10 troops as of July 2013that include 33.4% adult females, 8.4% adult males, 3.9% sub-adult males, 37.9% juveniles and 16.3 % infants. The average fertility rates of high- and medium-ranking adult females were similar, and slightly lower in low-ranking adult females. The average fertility rate of adult females in those 10 social troops was 51.9% (± 10.9, n = 10) in 2013. However, the average fertility rates of adult females in main troops B and C were low (39.7% and 40.6%, respectively) and in fact lower than the branch troops. The average fertility rates of the newly formed troop Bf (February 2013) was highest (80.0%). The continuing habitat fragmentation and human impacts have increased conflicts between people monkeys. The important theoretical and management implications of this study will contribute to the improved understanding of the least studied Formosan macaques. The results will be compared with the long-term study of *M. mulatta, M. fuscata, M. fascicularis* and other species in the genus *Macaca*.

**Mozharul Islam**
PhD Student, Hacettepe University, Turkey

# The Effect of Global Climate Change on the Coastal Areas of Bangladesh: The Identity Crisis of Environmentally Displaced People

This paper explores the effect of climate change in the global arena on the coastal areas especially on the coastal areas of Bangladesh and the identity crisis of environmentally displaced people. In so doing, it is tried to uncover the relationship between globalization and environment. By taking this relationship into consideration, special concentration is placed on the effect of climate change on coastal regions of Bangladesh. General Circulation Models suggest that if this increasing of the emission of greenhouse gases continues, the area-averaged annual mean warming would be about 3°C in the decade of the 2050s and 5°C in the decade of the 2080s over the land regions of Asia. Global climate changes affect the coastal areas around the world significantly specially in the low income countries like Bangladesh, Maldives etc. Here it is also examined some other coastal studies worldwide. In this paper, I employed my own arguments, where it is necessary, that I have learnt through my class participation of 'Global Conflicts' course at Philipps University-Marburg, Germany. It is clear from the review of some literatures that the relationship between globalization and environment is complex but the effect of the former is prominent on the latter. Finally it has been tried to clarify the identity of the environmentally displaced people on the bases of general and intellectual ideas and claimed for a distinct law for the protection of this group of people.

**Georgi Kadinov**
PhD Student, Forestry University, Bulgaria

# Evaluation of Air Quality in the Rhodope Mountains and its Effect on Vegetation

The aim of the present study was to determinate the change in the levels of air pollutants in the Rhodopes for the period 2009 to 2013. For the achievement of this goal a profound analysis of the data has to be performed and as a result of it to find out the potential risk for the forest ecosystems in this region.

The study was carried out on the territory of the Rhodopes and data obtained from Yundola air quality monitoring station and Rojen air background control station were used. Both stations are part of the national monitoring systems for air quality in forest ecosystems. Yundola monitoring station is located in western Rhodopes at 1600 m altitude on the border of a forest-vegetation area far from local sources of pollution. The region is representative for the coniferous forests. The main tree species are spruce (*Picea abies*) and fir (*Abies alba*). Rojen air background control station is located in the southern part of the Rhodopes at 1750 m altitude, far from local pollution sources. The main tree species is spruce (*Picea abies*).

The data collecting procedure is ensured by the "National Automated System for Environmental Monitoring (NASEM)", with sampling duration of 24 hours.

The results showed that the concentrations of sulphur and nitrogen do not exceed the critical levels determined for the protection of vegetation although some very high levels of concentrations during the observed period exceeding the critical levels 3 to 4 times were registered. After an additional analysis of these peak levels, it was concluded that this could be related to human activities.

The ozone concentrations measured at Yundola monitoring station exceed the target value for the protection of vegetation in terms of cumulative exposure over a threshold ozone concentration of 40 ppb (AOT40) 1.6 to 2.9 times. In the same time there was a trend of a steady increase of ozone levels. The situation at Rojen air background control station did not differ significantly. The ozone background levels were 2.5 times above the target value, a decrease in the ozone levels was observed only in 2010 where the concentration was 1.1 above the threshold.

**Chi-Chuan Kan**
Associate Professor, Chia-Nan University of Pharmacy & Science, Taiwan

# Study of Residual Aluminum Improvement in Drinking Water Treatment Plant

In recent years, high aluminum content in drinking water has been identified to cause health problems such as damage to the central nervous system. Countries such as Canada have set the drinking water standard for aluminum content. The United States Environmental Protection Agency included aluminum in the list of National Secondary Drinking Water Regulations, of which many states have implemented. Currently, Taiwan still does not include aluminum as a regulated parameter in the drinking water standards.

The Shan-Shang water purification plant treats raw water obtained from Zengwun dam, which usually has high turbidity. The treatment plant is composed of the following process treatment units: an initial coagulation unit, primary sedimentation tank, secondary coagulation unit, secondary sedimentation tank, and filtration system. The framework of the water treatment process includes two-stage dosing, where secondary coagulation is applied only when turbidity of treated water after primary coagulation does not meet water quality standards. Due to the two stages of coagulation, the presence of increased residual alum concentration was observed in treated water.

In this study, the main objective is to determine the efficiency of ferric chloride in the removal of residual alum from treated waters from Shan-Shang treatment plant. Jar tests were used to establish dosing curves of alum and ferric chloride as individual coagulants. The effect of pH and ferric chloride dosage on the removal of residual alum was investigated. In addition, cost analysis of using alum and ferric chloride was also carried out.

Ferric chloride proves to be a better coagulant in comparison to alum. Both alum and ferric chloride can obtain the following water parameters: residual alum content of 0.15 to 0.10 mg /L, turbidity of 1 NTU or less, total iron concentration of 0.02 mg/L, which meets the drinking water quality standards.

**Abd Elhamed Khater**
PhD Student, Tottori University, Japan
**Yoshinobu Kitamura**
Emeritus Professor, Tottori University, Japan
**Katsuyuki Shimizu**
Associate Professor, Tottori University, Japan
**Hiroaki Somura**
Associate Professor, Shimane University, Japan
&
**Waleed Hassan Abou El Hassan**
Associate Professor, NWRC, Water Management Research Institute, Egypt

# Improving Water Quality in the Nile Delta Irrigation Network by Regulating Reuse of Agricultural Drainage Water

In Egypt, the reuse of agricultural drainage water provides an integral supplement to the fresh water supply. Government pumping stations (official) and farmers' small diesel pumps (unofficial) lift water up from drainage canals and direct it back into the irrigation canals for reuse in agriculture, thereby increasing the country's available water resources by 12.6%. However, as water passes through the soil and drainage network, it sorb salts, agricultural chemicals, and other pollutants, leading to differences in the quality of drainage and irrigation water. Therefore, mixing the two water types deteriorates the overall quality. The common practice in Egypt is to mix drainage into fresh water up to the point where the salinity of the mixed water approach 1000 mg L-1. Some canals in the Kafr El-Sheikh Governorate have deficits of fresh water in some months. So, agricultural drainage channeled back in culverts connect the canal ends with the main drain (Bhr Nashrat) to provide supplemental water, but this return is not controlled and the flows are based only on differences in the hydraulic head. Current study evaluated the efficiency of using backflow to supplement the fresh water. Water supply ratio (WSR) indicator was employed in the analysis within two water supply conditions: (1) fresh water supply only and (2) fresh water supply plus backflow. During the summer 2008, WSR showed and average value of 0.93, and adding the backflow increased it to 1.27. During the following winter, WSR showed and average value of 1.50, and adding the backflow increased it to 1.82. Salinity measurements of water were taken during the study period at four locations – head, middle, tail, and drain – Salinity significantly increased toward the end of the canals. Excessive backflow

is the most serious constraint. The effect of backflow on the salinity were calculated then obtained improved salinity values by regulating the backflow. During the summer, backflow significantly deteriorated water quality, but only part of this backflow was actually required in June and July, just to make up the shortage, and not to exceed the requirements. During the following winter, fresh water availability was generally sufficient; however, backflow still occurred, leading to unnecessary deterioration of the water quality. If backflow is controlled according to the actual requirements, the water quality would be improved. An improvement in water salinity of over 30% was realized in June and July, and by 100% in May, August, September, and all winter months.

**Peiman Kianmehr**
Assistant Professor, American University of Dubai, United Arab Emirates
&
**Fadi Kfoury**
Professor, American University of Dubai, United Arab Emirates

# Application of Neural Networks to Estimate Methane Generation from Ozone-Pretreated Wastewater

The solid generated as the byproduct of wastewater treatment is called waste activated sludge (WAS). WAS consists of substantial amounts of organic matters such as biomass, cell debris and extracellular polymeric substances. Anaerobic digestion of WAS is known as controlled system at the absence of oxygen. It emits limited amount of gases into the atmosphere and generates biogas of 60% methane content. Methane is a combustible gas and known as renewable bio-resource energy. The most important drawback of anaerobic digestion is the slow process of organic matters bioconversion which is mainly due to the rate limiting hydrolysis process at the early stage of digestion. The pre-treatment of sludge prior to digestion processes is applied to accelerate the hydrolysis process and the effectiveness of the technique can be assessed using biogas generation rates. Ozone pre-treatment as a chemical pre-treatment technology is employed to enhance the hydrolysis rate as the rate limiting stage in digestion. The assessment of degradation rate of sludge is known as an important challenge in characterizing pretreatment impact on WAS biodegradability. The biochemical methanogenic potential (BMP) test is used to measure the methane generated gas in the headspace as an indicator of biodegradability.

A research project has been conducted to investigate the impacts of ozonation pre-treatment on a wide range of WAS samples. A wide range of ozonation duration was examined to investigate the impact of different intensity levels of pretreatment on sludge characteristics. The investigation of the methane profiles produced from BMP tests was based on Artificial Neural Networks (ANN). ANN was utilized in this research due to the highly complex relation that exists between the four studied parameters (Ozonation Duration, Sludge SRT, FCOD and FTKN) and the rate of methane production. The target of this research is to study the success of different combinations of the four studied parameters in predicting the rate of methane generation. Feed-Forward back-propagation 4-layer neural networks trained based on Levenberg-

Marquardt algorithm and validated based on the mean-squared error were utilized in this research. Preliminary results of this research were promising showing that not all of the studied parameters are needed for the prediction of methane profiles. In fact, the results showed that some parameters, when present together yield distorted predictions; however, when those parameters are isolated, accurate predictions are obtained.

**Joo-Heon Lee**
Professor, Joongbu University, South Korea

# Climate Change Impact on Statistical Characteristics of Korean drought based on Multi GCM Outputs

Korea experiences drought every year, with the only variations being drought severity and regional distribution. This fact is confirmed by records showing that large-scale drought has occurred at specified intervals from the middle and southern parts of the country. The goal of this study is to assess severe drought caused by climate changes by analyzing the spatial distribution characteristics and occurrence pattern of drought, to forecast regional vulnerability toward drought and to propose drought countermeasures against climate changes.

In this study, using the Standardized Precipitation Index (SPI), we analyzed the trends, periodicity, and drought occurrence frequencies to determine the statistical characteristics of droughts of South Korea. In an attempt to estimate the changes of statistical properties of drought, historical observed data (1974-2010) obtained from 54 automated weather stations(AWS) under the Korea Meteorological Administration (KMA) and projected precipitation data (2011-2099) by four Global Climate Models (GCMs): CNRM:CM3, CSIRO:MK3, CONS:ECHOG, UKMO:HADCM, were used. The drought characteristics during the historical drought events were analyzed, and statistical characteristics of future drought were predicted using the Mann-Kendall test, wavelet transform analysis, and drought frequency analysis.

The results of the Mann-Kendall test showed that, historically, droughts occurred more frequently in drier springs and winters than during summer and autumn. The wavelet transform analysis for the periodicity of historical drought showed significant powers in the band of 4 to 8 years, predicting future droughts with relatively shorter periodicity, with intervals of approximately 2 to 4 years.

In the analysis of occurrence frequency for the severely dry stages (with -1.5≥SPI) and the average severity of drought, severe drought occurred mainly in the southern part of the Korean Peninsula; however, in the future, areas with severe drought are expected to shift from the southern area to the middle part of the country. For the entire country, the occurrence frequency should decrease, with the average drought severity increasing substantially. Thus, results of this study predict that, even if drought duration shortens, drought severity will be intensified in the future.

**Jr-Lin Lin**
Assistant Researcher, National Chiao-Tung University, Taiwan

# Analysis of Carbon Emission Hot Spot and Pumping Energy Efficiency in Water Supply System

Evaluation of carbon emission hot spot for water treatment plants (WTPs) is crucial to reduce carbon emission. For conventional WTPs, the major carbon emission is energy used from pumping in water supply. Thus, pumping energy saving is very important in reducing carbon emission of WTPs. The pumping efficiency and energy consumption are significantly affected by flow rate. It is difficult to operate the pump at the best efficiency point as well as satisfy the requirement of potable water through properly adjusting the combination of pump. This study aims to analyze the data of carbon emission in the operation of Bansin WTP following the PAS 2050 guideline. The boundary of inventory and assessment includes the intake, the purification, and the distribution stages. In addition, pumping efficiency, power consumption per pump lift and specific energy consumption were used to estimate the potential of energy reduction in pumping for Bansin and Baoshan WTPs.

The results have revealed that carbon footprint of Bansin WTP is 0.39 kg $CO_2e/m^3$ in 2011. In addition, the use of pumping energy is carbon emission hot spot, which is responsible for 65% total carbon emission. The power consumption per pump lift can be calculated to evaluate the difference between rated power and operational power of pump. This can provide information for operator to replace or maintain the poor pump. The data of pump lift, flow rate and power also can be calculated to determine the relationship between pumping efficiency (%) and specific energy consumption (kW/Q), and then identify the optimum condition of pump combinations for a given production of water supply.

**Yihe Lu**
Professor, Research Center for Eco-Environmental Sciences, China
**Bojie Fu**
Research Center for Eco-Environmental Sciences, China
&
**Liwei Zhang**
Research Center for Eco-Environmental Sciences, China

# Recent Ecological Transition in China: Greening, Browning and the Influencing Factors

Ecological conservation and restoration are the staple solutions for environmental degradation problems from local to global scales. China has taken great efforts in ecological conservation and restoration with its established protected area networks and large scale ecological programs launched since the late 1990s. To understand the ecological transition during 2000-2010 in China, this paper analyzed the vegetation change trends of greening (restoration) and browning (degradation) on the basis of vegetation fraction quantification using MODIS NDVI at 250m ground resolution. Climate, socio-economy, and ecological conservation and restoration efforts were included to screen the influencing factors for vegetation change trends by correlation or comparative analyses. Results indicated that China experienced an ecological transition dominated by vegetation greening even the vegetation change trends differed substantially at provincial level. Socioeconomic factors such as human population, economic production, social investment and consumption, residents' income and consumption were detected to be significant driving forces for provincial level vegetation change trends. Nature reserves contribute to deceleration of vegetation browning, while, Natural Forest Protection Program as a large scale ecological conservation approach beyond nature reserves were both effective in curbing vegetation browning and facilitating vegetation greening. However, the Three-North Shelter Forest Program as a large scale ecological restoration in northern China need to be improved in its effectiveness on promoting vegetation greening. This paper highlighted the usability of vegetation change trends detection as a practical approach for large scale ecological transition assessment and the potential channels to promote vegetation greening via proper socioeconomic development and ecosystem management.

**Hani Mehanna**
Researcher, National Research Centre, Egypt
**Abdel-Salam El-Noemani**
Professor, National Research Centre, Egypt
&
**Sabreen Khlil Pepars**
Researcher, National Research Centre, Egypt

# Validation of SALTMED Model under Different Conditions of Drought and N Fertilizer for Snap Bean

This study aims to validate SALTMED model under different experimental treatments to prove that it is a useful tool for the decision makers in the farm. A field experiment took place in Kafer El-Zayat representing the Egyptian delta (clay loam soil) on snap bean (Phaseolus vulgaris) for the two successive seasons 2011 and 2012. The statistical design of the field experiment comprised three water regimes and three N fertilizer rates under drip irrigation system to test the validity of SALTMED model (version 2011), which has been developed for generic applications. The model employs solute transport, Evapotranspiration and crop water uptake equations. The results indicated that the model provided acceptable predictions of salt and water distributions in the soil profile under the drippers by using fertigation technique. Regression analysis between the observed and simulated data of salt and water distributions in the soil profiles showed a strong correlations higher than 0.8 for all experimental treatments. The highest significant values of snap bean yield 14.9 and 15.2 ton/fed. were obtained by using 150 kg N/fed. and 112.5 kg N/fed. (100% and 75% of the suggested N amount from the Agricultural and Land Reclamation Ministry) in the first and the second seasons, respectively, and irrigating plants by 100% Etc water regime (1542 $m^3$/fed.), in both seasons.

**Ana Joy Mendez**
Assistant Professor, University of Guam, USA

# Social Representations on Climate Change: Guam Youth and Young Adults Perspectives

The study looked at college students' meaning-making of climate change, using the lens of Social Representation Theory. Participants were 131 undergraduate students of the University of Guam who were asked to answer a free association questionnaire in which they were to write the first five ideas that came to their mind in their understanding and description of climate change. Abric's (2008) hierarchical evocation method was used in analyzing the data. Central to the understanding of students is that climate change is a plain modification in the patterns of weather, climate, season, temperature, and environment, and that it is very much associated with global warning. Peripheral elements include calamities and disasters, environmental destruction, incomprehensible weather, social impacts of climate change, as well as environmental abuses. Results have implications on the development and implementation of policies and strategies on climate change mitigation and adaptation.

**Zaki Moustafa**
Principal Scientist, South Florida Water Management District, USA
**Wasantha Lal**
Principal Engineer, South Florida Water Management District, USA
&
**Walter Wilcox**
Section Leader, South Florida Water Management District, USA

# Estimates of In-Situ Vegetation Resistance in Large Constructed Wetlands

In South Florida large constructed wetlands and above ground reservoirs are permanent tools used for reducing phosphorus and storing agricultural runoff. Yet, vegetation presence in those features also induces resistance to flow, which causes delays of water deliveries within and in-between features. Vegetation resistance depends on properties such as type, size, density, and stem flexibility. In wetlands vegetation resistance also depends on the hydraulic flow regime, which is determined by water depth and energy slope.

Our field tests are based on analytical solutions of the governing equations. Small sinusoidal discharge perturbations superimposed on near-steady state flow conditions were generated and portable data loggers were used to measure the spatial variability of water levels inside the wetland. Field tests results included the elapsed time for generated waves to reach different locations, and the rate of amplitude attenuation inside the wetland. Wave speed and attenuation are two basic linear characterizations of the governing equations for depth-averaged shallow water flow.

Results showed that there are two distinctly different depth-based flow regimes in vegetated wetlands. One flow regime shows predominantly laminar flow behavior, while the other shows exhibits turbulent flow behavior. Both flow regimes have significantly different discharge characteristics. This means that the discharge behavior during treatment and the discharge behavior during flood releases can be governed by two separate resistance equations. The discharge is proportional to water surface slope in the laminar flow case, and the square root of the water surface in the turbulent flow case. A mathematical function was developed that accounts for both type of flows encounter in a wetland. Additional field test are currently underway to further scrutinize the proposed function.

**Zagabathuni Venkata Panchakshari Murthy**
Professor & Head, Department of Chemical Engineering, S.V. National Institute of Technology, India

# Nickel Removal from Aqueous Solutions by Different Methods

Many conventional methods are used to remove heavy metals from waste streams like precipitation, adsorption, membrane separations, electrolytic methods, etc. and all of them have their own merits and demerits. In the present work, an attempt has been made to examine the efficiency of a natural biosorbent chitosan and a commercial ion-exchange resin for the removal of nickel from aqueous synthetic wastewaters.

Batch adsorption studies were conducted to study the effect of adsorption time, initial metal concentration and amount of biosorbent on the metal retained on chitosan. Excellent metal removal efficiencies were achieved with chitosan. The adsorption data was fitted well with Langmuir isotherm. Kinetic studies of the samples revealed that the intra-particle diffusion was the rate controlling step in this process. It was seen that the amount of biosorbent was a critical factor in the efficiency of adsorption and that the initial metal concentration also affected the amount of metal retained significantly.

An ion exchange resin under the trade name INDION-820, of Ion Exchange (India) Limited, has been used to study nickel removal efficiency. Experiments were performed with synthetic wastewater solutions at various concentrations. The operating variables studied are nickel feed concentration, pH and various feed flow rates. Separation data are obtained at different values of pH to study the influence of pH on rejection efficiency along with different feed flow rates. In most of the cases the rejection decreased with increase in feed flow rates. The experiments performed show satisfactory rejection even at low to medium flow rates. Nonetheless, one can be optimistic that the use of INDION 820 ion exchange resin in mild quantities is sufficient for optimal cost-effective recovery.

**Ana Paunovic**
Curator, Natural History Museum, Serbia
**Smiljka Simic**
Full Professor, Department of Biology and Ecology, Novi Sad, Serbia
&
**Georg Dzukic**
Retired, Institute for Biological Research Sinisa Stankovic, Serbia

# The Diet and of Eastern Spadefoot (*Pelobates syriacus*) in Macedonia

This paper presents the analysis of diet of 154 larval, juvenile and adult specimens of *Pelobates syriacus* from six localities in Macedonia, collected in period 1999-2000. Stomach flashing was used for sampling the material from adult frogs. The material from larval and juvenile specimens was taken from the existing collection of Macedonian Museum of Natural History in Skopje. High percentage of empty stomachs (38%) was found during summer. During spring and autumn around 10 % stomachs were empty. In the stomachs with a food there were from 1 to 7 prey components (certain prey taxa): 35% with 1 component, 39% with 2 components and 25% with 3 components. Stomachs with more prey components were far less frequent. Qualitative and quantitative analyses of food components were made for every locality separately, and then for all localities together. For some localities niche breadth and overlaps were calculated. Considering the importance indexes through all season of activities in Macedonia Coleoptera with 44,21% were the most important prey taxa, then Orthopera with 12,47% and Aranea with 9,07%. As the literature data on diet of species *Pelobates syriacus* are extremely scarce, the collected data and results are particularly important.

**Kasia A. Pawelek**
Assistant Professor, University of South Carolina Beaufort, USA
**Patrick Niehaus**
Student, University of South Carolina Beaufort, USA
**Cristian Salmeron**
Student, University of South Carolina Beaufort, USA
**Gregg J. Hunt**
Director, Beaufort County Mosquito Control, USA
&
**Elizabeth J. Hager**
Deputy Director/ Biologist, Beaufort County Mosquito Control, USA

# Modeling Dynamics of a Culex Quinquefasciatus Considering Impact of Climate Change, Natural Factors, and Assessing Control Strategies against the Spread of West Nile Virus

The West Nile Virus (WNV), a vector-borne disease spread by mosquitoes, remains a health concern worldwide. Mosquitoes carrying the virus are likely to develop in large numbers in nutrient‐rich water trapped in catch basins. The main mosquito species adopting this type of undergroundliving habitat is *Culex quinquefasciatus*, which is a main vector for WNV. Natural factors, such as rainfall and temperature, and climate changes in recent years highly influence potential vectors for the WNV underground habitat.

In this study we compared a mathematical model based on Ordinary Differential Equations to the mosquito surveillance data provided by the Beaufort County Mosquito Control, South Carolina, USA. Through the data fitting procedure we estimated parameters associated with spraying effectiveness, mosquito birth, maturation, and death rates. In addition, we conducted analysis of variance (ANOVA) to determine relationship between various mosquito trap locations and impact of rainfall and temperature on the number of mosquitoes in the traps.

Our results show that the low rainfall and high temperatures trigger activity and development in catch basins, which vary throughout the general vicinity in statistical significance. We utilized the results from data fitting in the epidemiological model for the spread of WNV to obtain more reliable disease outbreak predictions and performed numerical simulations to test various mosquito control strategies. Data fitting and statistical analysis for years 2004-2013 provide insights into the impact of natural factors and climate change on the number of mosquitoes and insecticide spray effectiveness for various years. Increasing surveillance of catch basins locations can help identify an

outbreak of WNV. Moreover, establishing a relationship between natural factors and climate change and mosquito activity can contribute to mobilizing control and prevention strategies to diminish the possibility of a WNV outbreak.

**Ivo Ercole Rigamonti**
Associate Professor, University of Milan, Italy
**Luigi Mariani**
Professor, University of Milan, Italy
**Gabriele Cola**
Professor, University of Milan, Italy
&
**Johann Baumgaertner**
Professor, Center for the Analysis of Sustainable Agricultural Systems, Switzerland

# Climate Change and Effects on the European Spread Pattern of Scaphoideus Titanus Ball

The grape leafhopper *Scaphoideus titanus* Ball is a major pest in many European viticultural areas, as vector of a quite dangerous quarantine pathogen, the Flavescence dorée phytoplasma. After its accidental introduction in the 1950s from North America, *S. titanus* colonized vineyards in France, Northern Italy, Southern Switzerland and Slovenia. However, after this preliminary spread, no further diffusion was reported until the end of the 1980s; so the above-listed regions were for long time considered as the habitat of the insect. However European climate changed abruptly at the end of the '80 with a thermal shift of +0.5 / +1.5 °C for yearly mean temperatures. In correspondence with this, *S. titanus* rapidly extended its habitat towards Northern and Eastern Europe and now its presence is reported from the Atlantic Ocean to the Black Sea.

On the light of these presuppositions, present day and future scenarios maps of *S. titanus* spread on European viticultural areas are of paramount importance to improve farmer decisions and public policies. To attain this aim, a modelling suite has been calibrated and validated for the reference period 1961-2010 on the Swiss area. The models have been applied to the whole European area to evaluate the suitability to insect colonization.

**Sombra Patricia Rivas Arancibia**
Professor, Meritorious Autonomous University of Puebla, Mexico
**Victor Hugo Minor Almazan**
Student, Meritorious Autonomous University of Puebla, Mexico
**Dulce Maria Figueroa Castro**
Professor, Meritorious Autonomous University of Puebla, Mexico
**Hortensia Carrillo Ruiz**
Professor, Meritorious Autonomous University of Puebla, Mexico
**Agustina Rosa Andres Hernandez**
Professor, Meritorious Autonomous University of Puebla, Mexico

# Heterotrophic Succession in *Neobuxbaumia Tetetzo* in an Arid Environment, in Central Mexico

Decaying columnar cacti represent a habitat in which succession of decomposer organisms take place. The sequence of colonization of such organisms depends upon the stage of decomposition of the plant. In this study, we characterize the stages of decomposition of *Neobuxbaumia tetetzo* at the same time that we identify the insects associated with the cactus on each stage. The study was conducted within the Helia Bravo Hollis Botanical Garden, Central Mexico. Every month during a year, we sampled stem tissue and all the insects associated with 45 decaying individuals of *N. tetetzo*. Stem tissue was brought to the laboratory to estimate water content; which was then used to determine the stage of decomposition. Collected insects were identified as morphospecies within orders and families. We found that decaying *N. tetetzo* individuals go through six stages of decomposition. Eight orders of insects were associated with decaying individuals of *N. tetetzo*: Coleoptera, Dictyoptera, Diptera, Hemiptera, Hymenoptera, Thysanoptera, Orthoptera and Isoptera. The abundance of Isoptera was highest at stages of decomposition with water content lower than 30%. Contrastingly, the highest abundance of Diptera, Orthoptera, Hemiptera and Thysanoptera was detected on early decomposing stages, which had more than 50% of water content. Lineal regression analyses between per insect Order-abundance and water content showed that the abundance of Coleoptera and Diptera significantly increased with water content. On the contrary, the highest diversity of insects was found on the lowest water content stages. These preliminary results suggest that decaying *N. tetetzo* provide more resources at intermediate decomposition stages and that they are a source for a diverse community of insects. Identification of insects to the species level would show seasonal changes in the insect community and among individuals of *N. tetetzo*.

**Nita Rukminasari**
Associate Professor, Hasanuddin University, Indonesia

# Fossil Fuel Burning and $CO_2$

Over the last 200 years, fossil fuel burning has released more than 250 billion tons of carbon in the form of $CO_2$ into the atmosphere. The ocean has taken up an excess of inorganic carbon from the atmosphere equivalent to approximately 25 – 30% of the total emission of $CO_2$ and 80% of which is stored in the upper 200 m of the water column. Decreasing in carbonate saturation state on the calcification rates of individual species and communiteis in both planktonic ad benthic habitats due to seawater acidification.

The study was conducted at three different locations, which were Barru, Takalar and Barrang Lompo Island using mesocosm technique with two different of incubation periods (48 and 96 hours). Six $CO_2$ concentrations was used as a treatments based on acid base treatments. $CO_2$ concentrations were 280, 380, 550, 650, 750 and 1000 ppm with 4 replicates for each treatment.

The study found that Increasing $CO_2$ concentration affected significantly to alkalinity, DIC, POC, PIC, physiological aspect of phytoplankton and photosynthesis and calcification rate.

Alkalinity and DIC were varied trend between location of mesocosm experiment and the treatments of $CO_2$ concentration and length period of incubation. In general, alkalinity decreased with increasing $CO_2$ concentration. However, length of incubation was showed no significant affected to DIC for all $CO_2$ concentration at Barru and Barrang Lompo mesocosm experiment. PIC and POC showed a varied response between all locations of mesocosms experiment. POC at Barru showed a higher at 48 hours than 96 hours of incubation period. For Takalar and Barrang Lompo mesoscosm experiment was an apposite trend, which was higher of POC at 96 hours than 48 hours of incubation period. There was a trend where increasing of POC with increasing of $CO_2$ concentration. PIC concentration at Barru and Takalar showed a slightl higher at 96 hours than 48 hours of incubation period and for Barrang Lompo mesocosm experiment PIC was higher at 48 hours than 96 hours of incubation period. Chlorophyll a and cell abundance was decresing with increasing $CO_2$ concentration for all location of mesocosm experiment. Increasing $CO_2$ concentration affected negatively to growth, photosynthesis and calcification rate. Growth, photosynthesis and calcification rate decreased with increasing $CO_2$ concentration.

**Bondan Supraptilah Sikoki**
Senior Researcher, Survey Meter, Indonesia
&
**Ni Wayan Suriastini**
Senior Researcher, Survey Meter, Indonesia

# Demographic Differential Vulnerability and Resilience to Natural Disasters in the Context of Climate Change Adaptation: Case Study from Mount Merapi Eruption in Indonesia

Disasters cause tremendous effects on social and economic wellbeing of a community. Agricultural households living in a disaster-prone area face additional risks over and above weather and market uncertainties. One way to reduce or minimize effects of a disaster is to implement knowledge-based strategy to increase the community's disaster preparedness and resilience. Living in disaster-prone country like Indonesia gives enough experience and lesson toward on how to adapt to these risks. However, a better and effective survival strategy can be developed based on scientific, systematic and measurable risk monitoring. This strategy is commonly adopted in disaster management and becoming important investment in community resilience against disaster.

In this study, we investigate how households living around an active volcano cope with these risks and uncertainties. We use data from the Longitudinal Study of Merapi 2012, a household and community survey that was conducted in four districts around the Merapi volcano Indonesia, in 2012, two years after the destructive eruption of 2010.

First, using contemporaneous as well as retrospective information from the data, we study the demographic differentials in vulnerability and resilience. Individuals' vulnerability to volcanic eruption depends significantly on the area where they live, while their economic vulnerability to climate change depends on how much they are dependent on the agricultural sector.

Second, we study how each demographic subgroup differ in terms of resiliency, using a measure of resilience that we constructed from the data. In particular we look how the index is different across demographic subgroups and across areas with different types of disaster risks.

**Amin Talei**
Lecturer, Monash University Malaysia, Malaysia
&
**Lloyd Hock Chye Chua**
Assistant Professor, Nanyang Technological University, Singapore

# Real Time Neural Fuzzy System for Runoff Forecasting

Neuro-Fuzzy Systems (NFS) are computational intelligence tools that have recently been employed in hydrological modeling. The learning algorithms used are based on batch learning where all the parameters of the fuzzy system are optimized off-line. Although these models have frequently been used, one criticism of batch learning is its inability to react to changes in the system. To solve this problem, the model must be capable of online or incremental learning. Secondly, the model should be capable of learning in real-time. To address these issues, Real Time Dynamic Evolving Neural Fuzzy Inference System (RT-DENFIS) has been developed. RT-DENFIS is a Takagi-Sugeno-type fuzzy inference system and utilizes online learning. In the present study, updating capabilities of RT-DENFIS is compared with the Adaptive Network-based Neuro-Fuzzy Inference System (ANFIS) which is a common batch (offline) NFS model for runoff forecasting in Rönne catchment, Sweden. A sub-catchment of Rönne named Klippan_2 with area of 241.3 $km^2$ was chosen for this study. The daily discharge time series from 1961 to 2003 have been used in this study where the antecedent discharge time series up to the present day are used as inputs to predict discharge up to three days ahead. The Different performance evaluation measures including coefficient of efficiency (*CE*), coefficient of determination ($r^2$), root mean square error (*RMSE*), mean absolute error (*MAE*), and relative peak estimation error (*RPE*) are used in this study. Results show that RT-DENFIS gave consistently better results without the need for retraining; however, the batch model (ANFIS) trained with historical data had to be retrained periodically in order to achieve similar results. Moreover, RT-DENFIS results are also compared with the results obtained by an autoregressive model with exogenous inputs (ARX) as a bench mark. It was revealed that RT-DENFIS is also superior to ARX model.

**Jorge Julian Velez Upegui**
Professor, University National of Colombia Sede Manizales, Colombia

# Environmental Assessment of Andean River Basins

The National Water Study (NWS) is the existing legal and technical instrument in Colombia to verify the availability of water supply, the water demand, the quality water objectives and the environmental indicators. All these proposed verification processes are set in isolation and do not integrate the various topics covered. For instance, the surface and groundwater hydrology has no direct relationship with water quality indicators into the Colombian regulations. Therefore, the environmental issues are addressed in a biased manner depending on the technical approach and the professional profile of the team in charge of the studies This paper presents a methodology to perform the assessment of environmental issues on channels and river basins based on the analysis of the geomorphological, hydrological, hydraulic, sedimentological, biotical and physical-chemical information gathered during the stream channel surveys. The main idea is to integrate all these information into indicators using the semaphore strategy, the correlations and graphic methods. The proposed methodology allowed us to integrate the collected information at the Risaralda and Chinchiná river basins, Andean basins, in where comprehensive surveys channel have been conducted in order to obtain the primary integration of environmental indicators to establish indicators of the state of water resources in river basins. The initial results indicate a strong environmental issue at the Chinchiná river basin and a slightly better behavior at the Risaralda river basin. This analysis will serve to NWS to improve their instruments of verification related with water resources and environmental issues.

**Wei Wei**
Associate Professor, Research Center for Eco-Environmental Sciences, China

# Ecosystem Services by Land Terracing: Environmental Significance and Problem Review

During the past hunderds of years, our human beings create many kinds of land-terracing measures in sloping conditions across different ecosystems, targeting fighting against hydrological disasters and increasing food suppy for themselves. These measures can be found across tropicial rainforests, deserts, semiarid and arid lands across the globe. Typical regions from literatures depicting the similar phenomenon can be found in Brazile, Italy, Vitenam, northern Tailand, Spain, America, the Three Gorges region in sourthern China, and the Loess Plateau region in northern China, and also many other regions. In general, ecosystem services provided by land-terracing in these mountainous regions are significant. By implementing such effective measures, soil erosion and mass movement can be controlled to a tolerable level. Soil properties (e.g. soil water content and nutrient retention) and land productivity are also improved. The slopes in the fragile climatic zones will be more stable after the conduction of land-terracing. In the water-limited ecosystems, land terracing also can enahnce the survival rate of planted vegetations and thus promote the positive progress in ecosystem restoration. Unfortunately, there still remain many problems about the land-terracing in both practice and theoritcal aspects. For example, the land-terracing measures created by our ancestors are very diverse, but we do not know wich is first choice and which are less powerful in different regions. More importantly, the conduction of land terracing has been blamed to be too casual and arbitrary, and without the restriction of environmental laws. In many areas, the degradation and even natural destory of poor-designed bench terraces have caused big losses of properties and ecosystem security, particularly under the uncertainties of climatic change. The deficiencies of basic knowledge regarding this issue are acknowleged in this research. We thus call on more studies should be focused on land-terracing in the forthcoming years.

**Fu Lung Wong**
Researcher, City University of Hong Kong, Hong Kong

# Nanomaterials-Based Sorbents for Oil Spill Cleanup in Water Environment

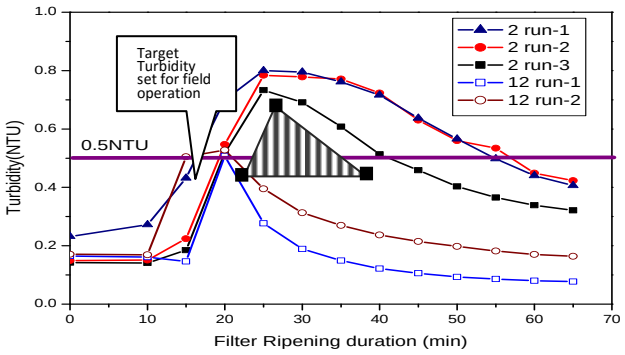
We developed a novel, low-cost and large area nanostructure enhanced oil sorbents for practical uses in clean up marine environment from oil spill or leakage. It is specifically designed to have oil sorbed (Q) value (i.e. mass of oil absorbed per mass of sorbents) up to 60 times. Most commercial oil sorption products have Q value of 20-25 only. Our nanosturcture enhanced oil sorbents was fabricated by synthesizing ZnO nanowires on commercial polymeric foam substrates with solution seeding and growing process. The nanowire parameters such as the length, the diameter and the wire density were optimized to provide extraordinary high surface area for oil sorption. A final PDMS surface treatment further enhances the oleophlicity of the oil sorbents. In oil absorption tests with various oil viscosities of 300 to 1200 MPa.s., our oil sorbents have Q value of up to 60 times. The best result is over 2 times better than that of most commercial products. In the oil recovery test, our oil sorbent allows the recovery over 90 % of oil. Besides, an ambient storage stability tests are being conducted on the oil sorbents, only a 15 % drop of the Q-value is found after the first 2 months and it appears to be stable up to 7 months. The test is still going on to investigate the long-term storage stability of our sobent. Toxicological tests were also performed, the results indicates that our oil sorbent is safe to human-being and marine organism. More important, the solution process of the ZnO nanowires fabrication provides a low cost and easy scale-up method for potential commercialization. This project is funded by the Innovation and Technology Commission (ITC) of Hong Kong S.A.R., PRC.

**Chih-Chao Wu**
Professor, Feng-Chia University, Taiwan

# Establishing Turbidity of Repined Diversity for Water and Waste Reducing in Backwash Operation for Rapid Filtration

Water and waste produce during backwash operation is a highly concerned issue especially for water supply facilities. Less backwash water and waste also mean more portable water available. The operation of filter-to-waste is a final and important step during Filter Repined Sequence operation to keep the high quality of water supply. Turbidity change (history) is mostly used to monitor the operation. However, there is still a lack of quantity indexes to evaluate the full performance of filter-to-waste operation. A simply and easily-obtained index, Turbidity of Repined Diversity (TD), is developed in this study to indicate the Filter Repined Sequence and to evaluate the backwash operation for reducing the volume of filter-to-waste. TD is a calculated triangle shape constructed from three data during the measurement of turbidity of filter repined period. Triangle is defined as the shadow area in Fig. Higher turbidity and longer duration time during repined period would result in higher TD value. In another words, lower TD produces less amount of the filter-to-waste. Fig. is the turbidity history of repined period of two rapid filters, No 2 and No.12, in Tang-Ding Water Supply Facility in southern Taiwan. Significantly, the triangle size above the line of target set for field operation and resulting TD values of No.2 are much larger than that of No.12, indicating much water wasted for No.2 operation. TD produced in each backwash run is tested and assessed to improve the following backwash operation. Therefore, more water and energy can be conserved. The backwash operation at Tang-Ding facility and TD involvement were highly successful.

**Figure.** *Turbidity history comparisons of repined period for No.2 and No.12 rapid filter in Tang-DingFacility*



**Hu Yang**
Professor, Nanjing University, China

# Novel Amphoteric Starch-Based Flocculants Can Flocculate Different Contaminants with even Opposite Surface Charges from Water through Molecular Structure Control

Precisely controlled molecular architectures have an important role in improving the performance of materials. However, studies on addressing the significance of molecular structure control of flocculants in water treatment are limited. In this work, novel amphoteric starch-based flocculants with different substitution degrees of functional groups (3-chloro-2-hydroxypropyl trimethyl ammonium chloride modified carboxymethyl starch, denoted as CMS-CTA) were synthesized. The flocculation experiments confirmed that the well-designed CMS-CTA flocculants exhibited improved performance in aspects of both optimal dosage and pH sensitivity, not only for kaolin, but also hematite suspensions, which have opposite surface charges. Further quantitative mathematical correlations among the preparation recipe, structural features, and flocculation properties were built, providing operational feasibility in the precise molecular control of the flocculants to achieve their desired flocculation performance. Further experimental results demonstrated that a proper flocculant was designed successfully according to the characteristics of the targeted contaminants and structure-activity relationship, proving the effectiveness of the molecular structure control for the optimization of the flocculation process.

**Marek Zoladek**
PhD Student, Pedagogical University of Cracow, Poland

# Modern Energy Sources in High Mountain Areas

In the past many inhabited areas in high mountains didn't have access to electricity. This caused a significant impact on the development if the areas. At the present time with advanced devices also difficult to access areas can use benefit from electricity. Examples of such places are mountain villages in the Himalaya and in the Andes. Interesting solutions producing electricity are located in mountain areas in the North America and in the Europe. In this way in the XXI century we can also use the devices supplied with electricity even during long lasting expeditions to the highest peaks of the earth.