THE ATHENS INSTITUTE FOR EDUCATION AND RESEARCH

Abstract Book:

12th Annual International Symposium on **Environment**

22-25 May 2017, Athens, Greece

Edited by
Gregory T. Papanikos

2017

Abstracts

12th Annual International Symposium on Environment

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First Published in Athens, Greece by the Athens Institute for Education and Research.
ISBN: 978-960-598-119-8

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www.atiner.gr

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(In Alphabetical Order by Author's Family name)

Preface

This book includes the abstracts of all the papers presented at the *12th Annual International Symposium on Environment, 22-25 May 2017*, organized by the Athens Institute for Education and Research (ATINER). In total 24 papers were submitted by 28 presenters, coming from 17 different countries (Albania, Australia, Canada, China, Cyprus, France, Iraq, Israel, Japan, Jordan, Kuwait, Poland, South Korea, Sweden, Tunisia, Turkey, and USA). The conference was organized into 10 sessions that included a variety of topic areas such as ecosystems, agriculture, climate change, and air quality. A full conference program can be found beginning on the next page. In accordance with ATINER's Publication Policy, the papers presented during this conference will be considered for inclusion in one of ATINER's many publications.

The purpose of this abstract book is to provide members of ATINER and other academics around the world with a resource through which to discover colleagues and additional research relevant to their own work. This purpose is in congruence with the overall mission of the institute. ATINER 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 to exchange ideas on their research and consider the future developments of their fields of study.

It is our hope that through ATINER's conferences and publications, Athens will become a place where academics and researchers from all over the world regularly meet to discuss the developments of their discipline and present their work. Since 1995, ATINER has organized more than 400 international conferences and has published nearly 200 books. Academically, the institute is organized into seven research divisions and 38 research units. Each research unit organizes at least one annual conference and undertakes various small and large research projects.

For each of these events, the involvement of multiple parties is crucial. I would like to thank all the participants, the members of the organizing and academic committees, and most importantly the administration staff of ATINER for putting this conference and its subsequent publications together.

Gregory T. Papanikos
President

FINAL CONFERENCE PROGRAM
12th Annual International Symposium on Environment, 22-25 May 2017 Athens, Greece
PROGRAM

Conference Venue: Titania Hotel, 52 Panepistimiou Avenue, Athens, Greece

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

Monday 22 May 2017

08:00-09:00 Registration and Refreshments

09:00-09:30 (Room C-Mezzanine Floor) Welcome and Opening Address

Gregory T. Papanikos, President, ATINER.

09:30-11:00 Session I (Room A – Ground Floor): Land, Soil & Agriculture

Chair: Olga Gkounta, Researcher, ATINER.

1. George Antonious, Professor, Kentucky State University, USA. Impact of Recycled Manure on Soil Enzymes and Crop Antioxidants Content.
2. Levent Basayigit, Professor and Head, Soil Science and Plant Nutrition Department, Suleyman Demirel University, Turkey. Prediction of N Deficiency in Peach Trees Using Environmentally Friendly Techniques: VNIR Spectroscopy.
3. Stephen Van Vleet, Regional Extension Specialist, Washington State University, USA. Restoration of Lands in Rest using Managed Grazing.

11:00-12:30 Session II (Room A – Ground Floor): A Panel on Air Pollution

Chair: George Antonious, Professor, Kentucky State University, USA.

1. Raimonda Totoni (Lilo), Head of Chemistry Department, Polytechnic University of Tirana, Albania, Edlira Baraj, Lecturer, Polytechnic University of Tirana, Albania, Vanela Prifti, Head of Laboratory, National Environmental Agency, Albania & Gjystina Fusha, Air Expert, National Environmental Agency, Albania. Study of $PM_{2.5}$ and PM_{10} Mass Concentration in Korça City. (ENVAIR)
2. Gwynn MacCarrick, Lecturer, University of Tasmania, Australia. International Monsanto Tribunal; Its Significance its Findings with Respect to the Crime of Ecocide. (ENVAIR)
3. *Eli Zaady, Researcher, Institute of Plant Sciences, Israel, Itzhak Katra, Ben-Gurion University of the Negev, Israel, Shlomo Sarig, The Katif Research Center, Israel, Shimshon Shuker, Institute of Plant Sciences, Israel & Yaakov Knoll, Institute of Plant Sciences, Israel. Examination of the Ecological Services of Planted Forests Bordering on Farmlands in Minimizing Leakage of Pesticides. (ENVAIR)

12:30-14:00 Session III (Room B – Ground Floor): Environment, the Industry and the Economy

Chair: 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.

1. Roland Leduc, Professor, Université de Sherbrooke, Canada, Marion Landry Carter, Graduate Student, Université de Sherbrooke, Canada, Hubert Cabana, Professor, Université de Sherbrooke, Canada & Amina Nait Sidi Ahmed, Professional Engineer, CRB Innovations Inc, Canada. Oxidation Processes for the Decontamination of Wastewaters from a Treated Wood Recycling Industry.
2. *Mohammed Abdulradh, PhD Student, University of Baghdad and Ministry of Agriculutre, Iraq, Osamah Kadhim Jbara, University of Baghdad, Iraq, Boubaker Dhehibi, International Center for Agricultural Research in the Dry Areas, Jordan & Kamel Shideed, International Center for Agricultural Research in the Dry Areas, Jordan. Technical and Environmental Efficiency of Wheat Farms in Saline Irrigated Areas of Central Iraq. (ECOENV)

3. Deniz Dolgen, Professor, Dokuz Eylul University, Turkey & *Mehmet Necdet Alpaslan, Professor, Dokuz Eylul University, Turkey. An Ecological Approach to Managing Industrial Wastewater Treatment Plant Sludges.

14:00-15:00 Lunch

15:00-16:30 Session IV (Room A – Ground Floor): Health and Food Issues

Chair: Roland Leduc, Professor, Université de Sherbrooke, Canada.

1. *Colin Seymour, Professor, McMaster University, Canada. The Effects of Chronic Exposure to Environmentally Relevant Activities of ^{226}Ra.
2. Alexandria Rivard, PhD Candidate, Texas A&M University at Galveston, USA & Wyndylyn von Zharen, Professor Emeritus, Texas A&M University at Galveston, USA. Fishing Gear and Set Methodology Models for Improving Target Species Catch success in Gulf of Mexico Longline Reef Fish Fisheries.
3. Camilla Sjors, PhD Student / Nutritionist, Karolinska Institutet, Sweden. Nutrient Intake and Greenhouse Gas Emissions of Current Food Habits in Sweden – Results from a National Diet Survey using 4-day Food Records.

16:30-18:30 Session V (Room C-Mezzanine Floor): *A Symposium on Ethics, Economics and Environment*

Chair: Panagiotis Petratos, Professor, Department of Computer Information Systems, California State University, Stanislaus, USA.

1. Patricia Hanna, Professor and Interim Chair of Linguistics, University of Utah, USA. Neither Love nor Money: What could save the Environment?
2. Frans P. de Vries, Professor, University of Stirling, U.K. Ethics and Environmental Markets.
3. Timothy M. Young, Professor and Graduate Director, Department of Forestry, Wildlife and Fisheries, Center for Renewable Carbon, The University of Tennessee, USA. Protecting Ethics, Economies, and the Environment in the Era of the Digital Citizen and Exponential Population Growth.
4. Nicolas Abatzoglou, Professor, Department of Chemical & Biotechnological Engineering, Université de Sherbrooke, Canada, Chair Pfizer, PAT in Pharmaceutical Engineering, Director GREEN-TPV and GRTP-C & P. Produce Fuels from Renewable Resources.

For details on the discussion please click here.

21:00-23:00 Greek Night and Dinner (Details during registration)

Tuesday 23 May 2017

07:30-10:30 Session VI (Room B-Ground Floor): An Educational Urban Walk in Modern and Ancient Athens

Chair: Gregory Katsas, Vice President of Academic Affairs, ATINER & Associate Professor, The American College of Greece-Deree College, Greece.

Group Discussion on Ancient and Modern Athens.
Visit to the Most Important Historical and Cultural Monuments of the City (be prepared to walk and talk as in the ancient peripatetic school of Aristotle

11:30-13:00 Session VII (Room A – Ground Floor): Materials

Chair: *Saif Uddin, Senior Research Scientist, Kuwait Institute for Scientific Research, Kuwait.

1. *Salim Hiziroglu, Professor, Oklahoma State University, USA & Aujchariya Chotikhun, PhD Student, Oklahoma State University, USA. Characterization of Wood Composite Panels Manufactured Using Modified Starch as Green Binder.
2. Kunio Yoshikawa, Professor, Tokyo Institute of Technology, Japan. Commercial Demonstration of Solid Fuel Production from Municipal Solid Waste by the Hydrothermal Treatment.
3. Alperen Kaymakci, Assistant Professor, Kastamonu University, Turkey & Nadir Ayrilmis, Professor, Istanbul University, Turkey. Characterization of Wood Plastic Nanocomposites Reinforced with Sepiolite Nano Fibers.

13:00-14:00 Lunch

14:00-15:30 Session VIII (Room A – Ground Floor): Special Technical Topics on Environmental Issues

Chair: *Salim Hiziroglu, Professor, Oklahoma State University, USA.

1. Xiao-Quan Chen, Associate Professor, South-China University of Technology, China, Wen-Hao Shen, Technical Director, South-China University of Technology, China & Shi-Bin Wu, Student, South-China University of Technology, China. Advanced Treatment of Papermaking Wastewater by Photocatalytic Oxidation with Nano-TiO_2 Colloids.
2. *Saif Uddin, Senior Research Scientist, Kuwait Institute for Scientific Research, Kuwait, Abdulaziz Aba, Kuwait Institute for Scientific Research, Kuwait, M. Behbehani, Kuwait Institute for Scientific Research, Kuwait, H. Al-Shammari, Kuwait Institute for Scientific Research, Kuwait & A.N. Al-Ghadban, Kuwait Institute for Scientific Research, Kuwait. Cesium and Plutonium in Gulf Waters.

15:30-17:00 Session IX (Room A – Ground Floor): A Panel on Impacts of Low Level Exposure to Radiation on Ecosystems

Chair: *Carmel Mothersill, Professor, McMaster University, Canada.

1. *Grzegorz Cieslar, Professor, Medical University of Silesia in Katowice, Poland, Dorota Stoltny, Assistant, Medical University of Silesia in Katowice, Poland & Karolina Sieron, Head, Medical University of Silesia in Katowice, Poland. Impact of Electromagnetic Field Emitted by Mobile Phone on Prooxidant/Antioxidant Balance in Brain of Male Rats. (ENVRAD)
2. Andrew Overholt, Associate Professor, MidAmerica Nazarene University, USA. Cosmogenic Ionizing Radiation and its Effects. (ENVRAD)
3. *Beatrice Gagnaire, Researcher, IRSN – Institute for Radioprotection and Nuclear Safety, France, Marilyne Stuart, Researcher, CNL – Canadian Nuclear Laboratories, Canada, Amy Festarini, Technician, CNL – Canadian Nuclear Laboratories, Canada, San Bog Kim, Researcher, CNL – Canadian Nuclear Laboratories, Canada, Francesca Farrow, Technician, CNL – Canadian Nuclear Laboratories, Canada, Isabelle Cavalie, Technician, IRSN – Institute for Radioprotection and Nuclear Safety, France & Christelle Adam-Guillermin, Researcher, IRSN–Institute for Radioprotection & Nuclear Safety, France. *In vivo* and *in situ* Evaluation of Tritium Effects on Fathead Minnow, *Pimephales promelas.* (ENVRAD)

17:00-19:30 Session X (Room A – Ground Floor): Air Quality, Pollution, Climate Changes and Other Environmental Issues

Chair: *Grzegorz Cieslar, Professor, Medical University of Silesia in Katowice, Poland.

1. *Carmel Mothersill, Professor, McMaster University, Canada. Low Doses, Adaptive Responses and Bystander Effects; Where are we now?
2. *Yong-Chul Jang, Professor, Chungnam National University, South Korea. Collection and Recycling of End-of-life Batteries in Korea by Extended Producer Responsibility (EPR).
3. Fidan Aslanova, Lecturer, Final International University, Cyprus & Serife Gunduz, Lecturer, Near East University, Cyprus. Investigation of the Level of Consciousness of Libyans about the Climate Change. (ENVEDU)
4. Lakdar Kairouani, Professor, National Engineering School of Tunis, Tunisia & Mouna Elakhdar, National Engineering School of Tunis, Tunisia. Enhanced Performances of Dual Refrigerator-Freezer Using new Environmental Refrigerants.

21:00- 22:30 Dinner (Details during registration)

Wednesday 24 May 2017
Educational Island Tour (Details during registration)
Or Mycenae and Epidaurus Visit (Details during registration)

Thursday 25 May 2017
Delphi Visit (Details during registration)

Mohammed Abdulradh
PhD Student, University of Baghdad and Ministry of Agriculutre, Iraq
Osamah Kadhim Jbara
University of Baghdad, Iraq
Boubaker Dhehibi
International Center for Agricultural Research in the Dry Areas, Jordan
&
Kamel Shideed
International Center for Agricultural Research in the Dry Areas, Jordan

Technical and Environmental Efficiency of Wheat Farms in Saline Irrigated Areas of Central Iraq

This study set out to investigate the impact of salinity on technical efficiency (TE) and environmental efficiency (EE) in wheat production in central Iraq, where 360 farmers have been interviewed and soil and water samples were collected and analyzed. This study aims to consider how farmers could re-allocative their resources in efficient and sustainable ways to produce viable agricultural production in the salt-affected areas of Iraq without introducing a new technology. Stochastic frontier analysis (SFA) approach was proposed to estimate both TE and EE in irrigated wheat production farms. The empirical findings showed that, on average, TE was 75% for low saline farms (EC less than 2.5 dSm^{-1}), 58% for moderate saline farms (EC ranging between 2.5 and 7.5 dSm^{-1}), and 32% in the sever saline farms (EC exceed 7.5dSm^{-1}).

While, the mean level of EE was 76%, 64%, and 34% for low, moderate, and high saline farms, respectively. Two main sources of environmental degradation have been considered: Urea, and DAP. The fertilizer (Urea) coefficient indicated that for improving EE by 1%, wheat yield need to be reduce by 6% through using recommended quantities of Urea fertilizer by farmer. Soil salinity level associated negatively with technical and environmental efficiency of farm.

George Antonious
Professor, Kentucky State University, USA

Impact of Recycled Manure on Soil Enzymes and Crop Antioxidants Content

The use of animal manure in agricultural production systems is an affordable way to reduce dependence on inorganic fertilizers and protects natural water resources. Arugula (Eruca sative) and mustard (Brassica juncea) were field-grown under under four soil management practices: 1) control (no-mulch untreated soil); 2) sewage sludge (SS); 3) horse manure (HM); and 4) chicken manure (CM) amended soils. The objectives of this investigation were to assess the impact of mixing native soil with animal manure on soil biological and plant nutritional properties and response to Kentucky farmers concern if animal manure could reduce dependence on inorganic fertilizers and provide an alternative source for improving soil enzymatic activity and nutrient status. SS and HM manure increased soil urease and invertase compared to no mulch soil indicating a stimulation of soil microbial activities. In addition, soil amended with SS or HM increased biomass production by 26 and 21% in arugula and mustard, respectively compared to the no-mulch bare soil. Regardless of crop type, SS, CM, and HM significantly ($P< 0.05$) increased ascorbic acid in plants by 90, 82, and 31%, respectively. Whereas, SS, CM, and HM significantly ($P< 0.05$) increased total phenols by 77, 70, and 36%, respectively compared to no mulch bare soil. Soil microbial activity is a direct indicator of soil fertility and health. Increasing costs of commercial fertilizers and release of large amounts of SS, CM, and HM worldwide have made cropland application of this waste an attractive disposal option.

Fidan Aslanova
Lecturer, Final International University, Cyprus
&
Serife Gunduz
Lecturer, Near East University, Cyprus

Investigation of the Level of Consciousness of Libyans about Climate Change

As of the first periods of history, the fact that human being has benefited from the natural resources and the efforts to improve life conditions has shown a continuous increase and diversification in the direction of technological developments. The fact that improving technological developments within time has provided people to intervene in the nature influentially, the usage of natural resources has reached a critical point in terms of both the environment and living creatures and it has caused to climate changes in conjunction with environmental pollution.

This research has been conducted in order to investigate the consciousness level of native people living in different regions of Libya on climate issue. The universe of the research consisted of native people living in Libya, while the sample consisted of 300 Libyans.

The scanning method was used in the research. A questionnaire was carried out in order that the levels of consciousness of participants on climate change could be investigated. The information that was obtained from the questionnaires were analyzed in computer environment by using SPSS 20.0 program.

Levent Basayigit
Professor and Head, Soil Science and Plant Nutrition Department,
Suleyman Demirel University, Turkey

Prediction of N Deficiency in Peach Trees Using Environmentally Friendly Techniques: VNIR Spectroscopy

Handheld spectrometers are allowed to measure the reflectance values of green plant leaves in field survey. These values are generally used to obtain the data about chlorophylls, mesophylls, and nutrient status. The most advantage of field spectrometers has a potential for developing without any chemical usage. Therefore this techniqe was called environment friendly.

This aim of the study was to predict the N deficiency in peach trees using the spectrometric measurements. Experiment was designed in nutrient-controlled containers. Peach seedlings were grown under various N deficiency conditions. The reflectance values of plant leaves were measured using Handheld Field spectrometer without any chemical usage. Collected plant leave samples were analyzed in laboratory and, their nutrient contents were determined. Afterwards, we performed a statistical comparison between the reflectance values and laboratory analysis results to establish significant wavelengths. Statistical analyses were also performed to accurate regression models for predicting N deficiency in peach leaves. Next, we verified the model validity by measuring the reflectance of the leaves collected from peach orchards at various locations using a Handheld Field spectrometer. Than nutrient deficiencies of these plants were calculated using the developed model. For validity, the predicted and measured data were compared.

We determined that use of 525 and 675 nm wavelengths for simplest model. were obtained the most accurate prediction for N deficiency in peach leaves Developed model was provided to enough accuracy using HandHeld spectrometer for maximum leaves samples while the least samples were analyzed in laboratory. In addition we conclude that for extensive use, ecologically based and environmentally interactive models need to be developed.

Xiao-Quan Chen
Associate Professor, South-China University of Technology, China
Wen-Hao Shen
Technical Director, South-China University of Technology, China
&
Shi-Bin Wu
Student, South-China University of Technology, China

Advanced Treatment of Papermaking Wastewater by Photocatalytic Oxidation with Nano-TiO_2 Colloids

The photocatalytic oxidation process of nano-TiO_2 is the most promising of the advanced treatment technologies to the organic wastewater, but there have been still two obstacles in its industrialization, which are how to separate the nano-TiO_2 from the treated wastewater and how to decrease the high cost. The paper reported the nano-TiO_2 colloids being used as photocatalyst to overcome above obstacles, basing on settleability of the colloidal solution by adjusting pH and the re-usage of the separated nano-TiO_2. The laboratory results shown the COD_{Cr} removal rate of the papermaking wastewater achieved 92.7% after 90 min UV light irradiation with 0.5 g/L nano-TiO_2 and 0.1 % H_2O_2, and the COD_{Cr} of the effluent was reduced to 7.6 mg/L. The raw papermaking wastewater was pretreated by flocculation with the ternary complex of 0.015% polyferric sulfate, 0.01% polyaluminium chloride and 0.001% nano-TiO_2 colloid. After five times reusing, the nano-TiO_2 photocatalyst still remained 88.5 % COD_{Cr} removal rate, where the 4.2 % decrement might be due to the wastage of the nano-TiO_2. According to the laboratory researches, a pilot scale equipment with the automatic control system was established and operated with the optimized process parameters so as to remove the 96.7 % COD_{Cr} and 99.7 % chromaticity of the model organic wastewater.

Grzegorz Cieslar
Professor, Medical University of Silesia in Katowice, Poland
Dorota Stoltny
Assistant, Medical University of Silesia in Katowice, Poland
&
Karolina Sieron
Head, Medical University of Silesia in Katowice, Poland

Impact of Electromagnetic Field Emitted by Mobile Phone on Prooxidant/Antioxidant Balance in Brain of Male Rats

In recent years human population is permanently exposed to radio-frequency electromagnetic fields emitted by mobile phones. The long-term exposure to those fields, due to the proximity of emission source, can potentially disturb the course of numerous metabolic reactions and physiological processes taking place in the brain, among them prooxidant/antioxidant balance, resulting in generation of oxidative stress. In this study the impact of whole-body exposure to electromagnetic field with a frequency of 900 MHz generated by mobile phone on prooxidant/antioxidant balance in selected structures of brain of male rats was estimated, by means of analysis of the contents of markers of membrane lipid peroxidation and oxidative stress: malone dialdehyde (MDA) and total oxidant capacity (TOC), respectively, the activity of antioxidant enzymes: superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx), glutathione reductase (GR) and glutathione S-transferase (GST), as well as the contents of marker of the activity of non-enzymatic antioxidant system: total antioxidant capacity (TAC).

The experiment was performed on 20 male Wistar rats, in mean age of 10 weeks, divided into 2 equal groups (consisting of 10 animals), subjected to long-term exposure to electromagnetic field or to sham-exposure, respectively. Rats from examined group were exposed for 28 succeeding days to electromagnetic field with frequency of 900 MHz generated by mobile phone Nokia 5110 placed under a cage with animals, that was turned on every ½ hour by 8 hours daily and each time emitted signal for 15 s. The mean value of power density of the electromagnetic field registered during initializing of connection was 85.3 $\mu W/m^2$, and during lasting connection was 17.0 $\mu W/m^2$. Rats from control group were exposed for 28 succeeding days to sham-exposure, during which they stayed in identical as exposed animals environmental conditions, excluding the influence of electromagnetic field. After the end of a cycle of 28 daily exposures to electromagnetic

field or sham-exposures (control rats), animals were starved by 24 hours, then subjected to autopsy and next the specimens of selected brain structures as: frontal cortex, hippocampus, brainstem, hypothalamus, striatum and cerebellum were taken. In the homogenates prepared from the obtained specimens the contents of MDA, TOC and TAC, as well as the activity of SOD, CAT, GPx, GR and GST were measured. The biochemical analyses were performed by means of routine spectrophotometric and kinetic methods.

On the basis of the obtained results it was found, that 4-week lasting exposure of rats to electromagnetic field with physical parameters generated by mobile phone working in a frequency range of 900 MHz, causes increase of intensity of the process of peroxidation of membrane lipids in all examined brain structures, and in the hypothalamus and cerebellum additionally increase in the activity of other oxidative processes, as well as the increase in the activity of catalase and decrease in the activity of most of remaining antioxidant enzymes in examined brain structures, apart from the hypothalamus. On the other hand this exposure did not affect significantly the activity of the non-enzymatic antioxidant system in examined brain structures. Changes of activity of antioxidant enzymes were probably of compensatory nature and they were caused by the depletion of the pool of these enzymes in brain structures as a result of the excessive use of them for neutralizing of the increased quantity of the free radicals and products of lipids peroxidation occurring in the conditions of exposure to electromagnetic field.

Deniz Dolgen
Professor, Dokuz Eylul University, Turkey
&
Mehmet Necdet Alpaslan
Professor, Dokuz Eylul University, Turkey

An Ecological Approach to Managing Industrial Wastewater Treatment Plant Sludges

Land application of industrial wastewater treatment plant (IWWTP) sludge for farming or vegetation growth is important issue for ecological sustainability and life cycle assessment of wastes. Therefore, the aim of the paper is to investigate the land use potential of the industrial wastewater treatment plant sludge (agro-industry) by defining the sludge characteristics and by determining the sludge application ratio. In this framework, sludge samples produced from vegetable processing, olive oil, and meat processing wastewater treatment plants were used. Characterization study was carried out and parameters limiting reuse potential were determined. The pH, salinity, solids content, moisture content, organic matter, organic carbon, nitrogen, phosphorus, potassium, iron, magnesium, sodium, calcium as well as heavy metals (Cu, Zn, Cd, Cr, Pb, Ni) were measured to determine the physical and chemical properties of the sludge samples. Results shown that, heavy metal concentrations detected in the sludge samples obtained from the selected industries were lower than the tolerance limits set by the national authority.

In order to investigate the metal accumulation on plant leaves and roots, the sludge was amended with soil mixture and applied at various rates to promote the growth of lettuce and cucumber plants. Vegetable processing industry sludge was used for growth of lettuce and cucumber plants. The sludge application caused no significant increase in heavy metal concentrations in the plant leaves, though zinc and iron were found at elevated concentrations. However, despite the zinc and iron accumulation, no toxicity symptoms were observed in the plants. Similar to vegetable processing industry sludge, lower metal uptakes were also measured for olive oil industry sludge. Only the cadmium and lead concentrations in the lettuce plants exceed the maximum permissible metal concentrations. Cadmium generally tends to accumulate in leaves, and therefore is more risky especially for leafy vegetables. Since, increase in the dietary uptake of cadmium is a potential risk to human health, a careful assessment of plant species to be grown, is required prior to land application of sewage sludge.

In conclusion, since sludge contains certain elements that are useful for the agricultural production, it may deserve particular interest for agro industries. Trace element can accumulate in the plant tissue, e.g. leaves, and therefore it should be considered by appropriate low sludge application rates.

Beatrice Gagnaire
Researcher, IRSN – Institute for Radioprotection and Nuclear Safety, France
Marilyne Stuart
Researcher, CNL – Canadian Nuclear Laboratories, Canada
Amy Festarini
Technician, CNL – Canadian Nuclear Laboratories, Canada
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&
Christelle Adam-Guillermin
Researcher, IRSN–Institute for Radioprotection & Nuclear Safety, France

In vivo and *in situ* Evaluation of Tritium Effects on Fathead Minnow, *Pimephales promelas*

The issue of biological effects of exposure to ionising radiation is of major concern for both human and environmental radiation protection. This has been recently highlighted after the Fukushima accident, especially with respect to the quantification of the magnitude of risk to individual (human) and population (human and biota) health at low dose rates. Gaining knowledge on low dose effects on human and non-human species will therefore provide robustness in effects predictions and decision-making.

The nuclear industry's discharge in the environment several types of radionuclides, mostly gamma emitters (^{137}Cs, ^{60}Co, ^{54}Mn), but also tritium, the most important in terms of quantity (annual production of 200 g corresponding to $7.2.10^{16}$ Bq/year in the world). Tritium is a radioisotope of hydrogen, emetting low energy beta rays. Its half-life is 12,3 years. Tritium releases are supposed to increase in the future with the development of new reactors based on nuclear fusion (ITER: International Thermonuclear Experimental Reactor).

Aquatic ecosystems, which are inhabited by several animal species, are usually the final receptors of a large number of pollutants, including radionuclides, as nuclear power plants are connected to surrounding rivers or marine environment. The exposition to high levels of

radionuclides is known to induce important alterations on several functions of the organism, from molecule (DNA integrity) to population (effectson survival and reproduction) but less is known about the effects of environmentally relevant chronic low-level exposure.

In this context, a field experiment aiming to study tritium effects on fish have been performed in Canada in collaboration between CNL and IRSN. Fathead minnows, *Pimephales promelas*, were placed at five sites presenting an increasing tritium contamination (from 40 to 12000 Bq/L) and other pollutants. The influence of a tritium supply via food, by comparaison with an exposition only to water, was tested on tritium biokinetic (accumulation and elimination of tritium) and on biological effects. The contamination period lasted 60 days and was followed by a depuration period of 60 days. For each site, several biomarkers of immunity, oxidative stress, neurotoxicity and genotoxicity were followed in fish. Results showed transitory effects on DNA damage levels (comet, H2AX) and on micronucleus frequencies, and non-reversible effects on acetylcholinesterase. This work was completed by a laboratory experiment on the same fish species contaminated only with tritium in order to study effects of tritium alone. Once completed, the two datasets will help to better understand the effects of tritium, alone or in mixtures, on fish physiology.

Salim Hiziroglu
Professor, Oklahoma State University, USA
&
Aujchariya Chotikhun
PhD Student, Oklahoma State University, USA

Characterization of Wood Composite Panels Manufactured Using Modified Starch as Green Binder

The objective of this study was to evaluate basic properties of particleboard panels manufactured from Eastern redcedar (*Juniperus viginiana* L.) using modified corn starch and low percent of urea formaldehyde as binder. Experimental particleboard panels in the form of three-layer configuration were made from the raw material at various density levels. Dried particles were classified into two particle sizes, namely fine and coarse on 20 mesh and 60 mesh screen, respectively. Coarse particles were used for the core layer of the three-layer particleboard while the fine particles were used for the surface layers of the board. Bending characteristics, namely modulus of elastically (MOE), modulus of rupture (MOR), internal bond strength (IB) in addition to dimensional stability and surface roughness of the samples were determined. The highest MOE and MOR values of the samples with 0.80 g/cm^3 density level were found as 2,344.32 MPa, and 12.14 MPa, respectively. Both bending and IB values of the samples were comparable to those of commercially manufactured panels from other species. Formaldehyde emission of the samples was considerable low suggesting these panels are very environmentally friendly. It appears that dimensional stability of the panels needs to be enhanced. Based on the findings in this work modified starch could have potential as green binder in particleboard manufacture.

Yong-Chul Jang
Professor, Chungnam National University, South Korea

Collection and Recycling of End-of-life Batteries in Korea by Extended Producer Responsibility (EPR)

The use of batteries by consumers for electrical and electronic devices has rapidly grown worldwide along with technical development. As batteries reach end-of-life, large amounts of used and end-of-life batteries are generated from households and industrial sectors. They typically contain a variety of valuable elements as well as toxic materials. Thus, environmentally sound management of such materials is an issue of concern around the world. Although many efforts on collection and recycling of waste battery are currently made in many countries, only a small fraction is recovered for resource recovery. Understanding of the current management practices and analysis of quantitative flow of used battery are critical when considering the potential resource recovery as well as potential impacts on the environment upon disposal.

In this paper, the generation, collection and recycling systems of used batteries by the extended producer responsibility(EPR) policy in South Korea are discussed, based on review of available literature, site visits to battery recycling facilities, and interviews with the Korea Association of Battery Recycling, local governments, and the Ministry of Environment. Material flow analysis of the battery has been performed to determine the potential resource recovery by recycling. Several suggestions have been made to improve current recycling practices of the batteries for resource recovery.

Lakdar Kairouani
Professor, National Engineering School of Tunis, Tunisia
&
Mouna Elakhdar
National Engineering School of Tunis, Tunisia

Enhanced Performances of Dual Refrigerator-Freezer Using new Environmental Refrigerants

A vapor compression refrigeration system with double refrigerating temperatures is presented and analyzed. This system includes an ejector inserted between the two refrigerating loops. This system has energy saving potential by reducing the compression ratio due to the evaporating temperatures difference. In this work, an energetic investigation for the most advantageous compositions of hydrocarbon mixtures R600a/R600, R290/R600a, and R290/R600, and cycle conditions was performed. The performances of the system are predicted using R134a and various hydrocarbon mixtures in order to determine the most excellent hydrocarbon mixture to be used as the R134a substitute in this system. The refrigerant thermodynamic properties are calculated by using REFPROP database subroutines and the calculating program is written with Fortran Language.

The simulation results indicate that there exists an optimal mixture composition for the dual refrigerating system that done the maximum coefficient of performance. The results show that the new system outperforms the conventional cycle obviously in terms of COP. Specifically; the COP can be improved by about 24% by using the mixture R290/R600 with 60% propane. Moreover, it is obtained that the R290/R600 mixture with 80% propane is the best drop in replacement for R134a in this system under operating conditions since it gives the same volumetric capacity to that using R134a.

The performance characteristics of the new system may show its promise in domestic refrigerator-freezer applications. The hydrocarbon mixture offers desirable environmental requirements, such as zero ODP and insignificant GWP.

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Characterization of Wood Plastic Nanocomposites Reinforced with Sepiolite Nano Fibers

Effect of sepiolite nano fibers (SNFs) on physical, mechanical and thermal properties of wood polymer nanocomposites was investigated. To meet this objective, pine wood flour, polypropylene (PP) with coupling agent (MAPP), and SNF (0, 1, 3, 5, 7 wt%) were compounded in a twin-screw co-rotating extruder. The mass ratio of the wood flour to PP was 50/50 (w/w) in all compounds. Test specimens were produced using injection-molding machine from the pellets. The flexural and tensile properties of the wood polymer nanocomposites decreased with increasing with content of the SNFs (from 1 to 7 wt%) and MAPP (3 wt%). The mass loss rates of the wood polymer nanocomposites decreased with increasing amounts of the MAPP and SNF. The DSC analysis showed that the melt crystallization enthalpies of the wood polymer nanocomposites increased with increasing amount of the SNF. The increase in the T_c indicated that the SNF was the efficient nucleating agent for the wood polymer nanocomposites.

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Oxidation Processes for the Decontamination of Wastewaters from a Treated Wood Recycling Industry

Treated wood recycling industries face environmental issues as the processes involved generate wastewaters that can be heavily contaminated with various biocides. One such industry, located in Quebec (Canada), generates wastewaters containing mainly phenolic compounds, mostly as pentachlorophenol (PCP), and others to a lesser extent such as polycyclic aromatic hydrocarbons (PAHs).

Moreover, these wastewaters have a pH greater than 12. The industry aims at discharging these wastewaters in one among two nearby municipal wastewater collection systems for further treatment in their wastewater treatment facilities.

The objective of the project is to treat this industrial wastewater such as to meet the requirements of the two cities of Sherbrooke and East Angus for discharging it into their sanitary sewers. Basic oxidation processes (UV, H2O2 and O3), and advanced oxidation processes (UV/TiO2, Fenton, H2O2, UV/H2O2, O3, O3/UV, O3/H2O2 and O3/UV/H2O2) were tested to treat this wastewater.

The criteria studied are the reduction of pH, as well as the reduction of PCP and of chemical oxygen demand (COD). A 3-step optimization procedure was used.

The results have shown that O3 and O3/H2O2 processes were the most favorable in terms of removal efficiency. These processes allowed to meet the pH and PCP requirements of both cities after 30 minutes of treatment. They also allow a reduction of COD of 30 and 48% respectively after 30 minutes. For both processes, the optimum conditions are an ozone flow rate of 145 mg/L*min, an initial pH of 12.5 and a treatment time of 30 minutes. The optimal concentration of H2O2 is 3.75 mg / L for O3/H2O2.

With O3/H2O2, the pH reached 7.75 and the PCP concentration is 0.07 mg/L after 30 minutes of treatment. The 5-day biochemical oxygen

demand at 5 days (BOD5) is also considerably reduced after 30 minutes of treatment.

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International Monsanto Tribunal: Its Significance its Findings with Respect to the Crime of Ecocide

On 15-16 October 2016 the International Monsanto Tribunal (IMT) convened at the seat of the International Court of Justice, in the Hague. The author was appointed *Amicus curiae* to the International Monsanto Tribunal on the question of Ecocide and this paper seeks to address the significance of both the Tribunal and its findings.

The IMT was an international civil society initiative to hold the Defendant Company accountable for human rights violations, for complicity to war crimes, and potentially for the crime of Ecocide. Eminent judges are due to deliver an advisory opinion (pursuant to the procedures of the International Court of Justice) expected in April 2017 based upon the testimonies from victims, and legal submission made.

The defendant Company Monsanto is a publicly traded American multinational agrochemical and agricultural biotechnology corporation and is one of the first companies to genetically modify plant cells, and conduct field trials of genetically modified crops. They have played a major role in changing global agricultural practices, including; engineering biotechnology products; promoting the ubiquitous use of agrochemicals in the production of food and feed crops; the patenting and promoting of transgenic crops that have contaminated organic farming; along with a history of complicit involvement in the use of chemicals on ecological areas with the specific intention of targeting human populations for military objectives. These past and present activities have placed the defendant in the spotlight and the forefront of this Tribunal's scrutiny. Monsanto is the obvious defendant, in every respect an exemplar of the wanton environmental destruction that form the basis and substance of the crime of Ecocide.

The legal action against Monsanto is both a defensive and an affirmative claim to halt environmental damage. Through this immense legal effort, it is hoped that this Tribunal can provide an internationally authoritative advisory opinion that ecocide meets the threshold to be considered as a *jus cogens* crime. It is also hoped that through this international civil society initiative, that support will grow for a criminal enforcement framework that is capable of bringing multinationals to account, for their catastrophic environmental footprint.

Undoubtedly the work of this Tribunal will contribute to the

progressive development of international law by clarifying the content of the human rights responsibilities of companies and informing the debate on whether international criminal law should recognise the crime of Ecocide. For the first time a citizen's initiative is attempting to initiate international legal dialogue and start a conversation about how the global community might bridge the 'accountability gap' of multinational companies engaging in environmental destruction injurious to the common interests of humankind.

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Low Doses, Adaptive Responses and Bystander Effects; Where are we now?

The field of low-dose radiobiology has advanced considerably in the last 30 years from small indications in the 1980's to a paradigm shift that occurred during the 1990's, which severely dented the DNA centric theories that had dominated until then. However while the science has evolved, the application of that science in medicine and environmental health protection has not. A reason for this appears to be the uncertainties regarding the shape of the low dose response curve, which lead regulators to adopt a precautionary approach to radiation protection. However the recent advances in preconditioning research suggest that one sided application of a precautionary principle may actually be doing harm and that a more flexible approach based on sound knowledge of basic mechanisms and individual variation in response may need to be considered. This presentation will review low dose effects and mechanisms focusing on so called non-targeted effects, which predominate at low doses. The aim will be to demonstrate just how variable low dose responses are, and how they are so dependent on context, underlying genetics, other environmental stressors and epigenetic responses. When aiming to protect, the approach is always to err on the side of caution, which currently means reducing exposure using the ALARA principle but what if the low dose exposure is beneficial? How can this be accommodated in regulatory systems especially if it only applies to subsections of the population or if the dose of highest benefit (DHB) is on a spectrum determined by other factors? The idea will be explored in this paper, that lessons can be learned from radiation protection approaches to non-human biota where populations not individuals are the target of protection efforts. While clearly the target of protection for humans is the individual, some of the modeling approaches being used to derive system level risk factors, may yield new concepts deserving of exploration.

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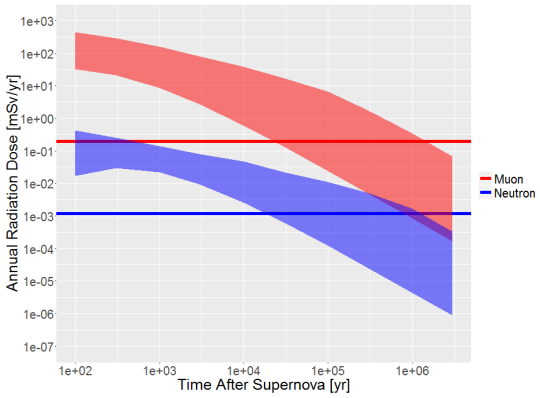
Cosmogenic Ionizing Radiation and its Effects

Under current conditions, the radiation dose from cosmogenic radiation comprises a small but measurable portion of the background. This radiation varies with altitude and has been shown to cause health risk to those living at higher altitude and flight crews. Events such as solar flares, solar proton events, gamma ray bursts, and nearby supernovae are known to increase the cosmic ray flux at the Earth to much greater amounts that currently experienced.

My work has used Monte Carlo simulations (CORSIKA and MCNPx) to simulate the radiation dose from these hazardous astrophysical events. Our simulations provide us with particle fluxes during the event for all particles which reach ground level. Among these particles, muons and neutrons prove to be the greatest risk to life, in agreeance with the current cosmogenic background. Our simulations give us insight into the exact radiation dose experienced by solar proton events as well as nearby supernovae.



I find that the radiation dose due to solar events is very small. Despite its size, this dose has been shown in previous work to have correlations with increases in the rate of congenital malformations within the public. By contrast, the dose increase due to a nearby supernova can be quite large depending on the proximity of the nearby supernovae. Large amounts of evidence have been found through ocean sediment cores finding a supernova occurred roughly 150 light years away from the Earth 2-2.5 Myr ago. Our simulations find that this event produces ground level radiation levels which are greatly increased above the background to levels of 100 mSv/yr or more. Additionally, the nature of cosmic ray propagation through the galaxy places the duration of such an event in the thousands to tens of thousands of years. We find that this is likely a large enough impact to both increase the risk of cancer, but also increase the mutation rate of organisms on the Earth at that time.

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Fishing Gear and Set Methodology Models for Improving Target Species Catch success in Gulf of Mexico Longline Reef Fish Fisheries

Bycatch of non-target species in many fisheries can contribute to mortality of discarded individuals and negative environmental impacts. The objective of this study was to predict the capability of commercial fishers to successfully obtain a targeted species of grouper, snapper, or porgy based on the fishing gear and set configuration employed. Data were collected by the Southeast Fisheries Science Center (SEFSC) Galveston Reef Fish Observer Program from 2006-2014 as mandated under the Gulf of Mexico Fishery Management Council (GMFMC) Reef Fish Fishery Management Plan. Binomial regression models using the complementary log-log link function (except red grouper, log odds link function) were constructed in R version 3.2.3 using backwards regression to predict target species catch success using variables directly manipulated by fishers, including soak time, fishing depth, main line length, hooks deployed, gangion length, hook distance, and the temporal variables month and year. An ANOVA was used to calculate the significance of the final model against the null model, and McFadden's R^2 (R^2_{McF}) was calculated to determine the proportional reduction in error variance from the null model. Significant models were generated for speckled hind ($p < 0.01$, $R^2_{McF} = 0.204$), red grouper ($p < 0.01$, $R^2_{McF} = 0.023$), scamp ($p < 0.01$, $R^2_{McF} = 0.183$), gag grouper ($p < 0.01$, $R^2_{McF} = 0.090$), red snapper ($p < 0.01$, $R^2_{McF} = 0.059$), mutton snapper ($p < 0.01$, $R^2_{McF} = 0.330$), jolthead porgy ($p < 0.01$, $R^2_{McF} = 0.124$), and red porgy ($p < 0.01$, $R^2_{McF} = 0.120$). These models ultimately serve as guidelines for fishers to adjust fishing practices to improve the likelihood of successfully obtaining the species targeted, which may reduce bycatch mortality of non-target species and its resulting environmental impacts.

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The Effects of Chronic Exposure to Environmentally Relevant Activities of ^{226}Ra

Actinides are assigned an RBE (relative biological effectiveness) factor of between 20 and 40 but this value is highly uncertain due to lack of data. The aim of this research is to assess the impact of lifetime ingestion of environmentally relevant levels ^{226}Ra on a common freshwater fish species. Fathead minnow were obtained at the first feeding stage and established on a commercial fish food diet containing ^{226}Ra in the activity range 10mBq/g-10Bq/g. They remained on this diet for 24 months and were sampled invasively at 1,6 and 18 and 24 months and non-invasively also at 12 and 15 months. Fish fed 10 and 100mBq/g diets showed a small, transitory dysregulation of growth at 6 and 12 months. Fish fed higher activities showed similar or even less significant effects. Bioaccumulation of radium at 1 month was below detection levels. At six months significant amounts of ^{226}Ra were present but at 18 and 24 months radium levels were at background in spite of the continued ingestion of the isotope. Assessment of bystander stress signaling throughout the time period showed a constant fish to fish signaling at all times and doses measured. RBE values were 1-1.5 for radium versus x-rays. We conclude that fathead minnow develop an effective depuration mechanism suggesting an adaptive response to radium exposure is induced in these fish. The results suggest that low dose effects seen after chronic exposure to radium are different to high dose effects and may not merit the use of highly conservative RBE values.

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Nutrient Intake and Greenhouse Gas Emissions of Current Food Habits in Sweden – Results from a National Diet Survey using 4-day Food Records

Aim: In this study we aim to analyze the relationship between greenhouse gas emissions from diet, intake of nutrients as well as adherence to the Nordic Nutrition Recommendations 2012 (NNR 2012) for Swedish adults.

Materials and methods: We use self-reported dietary data from the Swedish National Dietary Survey, where the participants completed 4-day food records. All foods are linked to carbon dioxide equivalents (CO_2e) in order to calculate average greenhouse gas emissions per person and day. Then we divide the participants' in four groups according to energy-adjusted diet-related CO_2e. We explore differences in nutrient intake as well as adherence to NNR 2012 between the group with lowest and highest CO_2e. Women (n=962) and men (n=774) are analyzed separately.

Results and conclusions: The group with lowest CO_2e is more in line with recommendations regarding protein, carbohydrates, dietary fibre, folate and vitamin D, compared to the highest CO_2e group, for both women and men. In contrast, the group with lowest CO_2e is further from the recommendation regarding added sugar, for both sexes. Looking at the overall adherence to recommendations, the results are better for the group with lowest CO_2e. 37% of the women in the lowest CO_2e group adhere to at least 20 recommendations compared to only 22% in the highest CO_2e group. The corresponding numbers for men are 40% and 29%, respectively. We are first to study the adherence to the nutrient recommendations for different levels of greenhouse gas emissions. Our conclusion is that the participants with the lowest CO_2e have higher adherence to current nutrition recommendations in comparison to the participants with higher CO_2e.

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Study of $PM_{2.5}$ and PM_{10} Mass Concentration in Korça City

The monitoring data of particulate matter ($PM_{2.5}$ and PM_{10}) mass concentration in Korça city are presented and analyzed in this paper. During the study period (January- December 2014) the mean concentration of $PM_{2.5}$ and PM_{10} were found to be 24.8μg/m^3 and 37.9 μg/m^3 respectively. The results show clear variation of these two fractions, in seasonal average mass concentration. The higher $PM_{2.5}$ and PM_{10} mean concentration belongs to winter, reaching respectively 56.2 μg/m^3 and 50.2 μg/m^3. Minimum of $PM_{2.5}$ and PM_{10} mean values of 9.2 μg/m^3 and 28.2 μg/m^3 occurred during the summer season. December seems to be most polluted month by PM fractions, presenting a mean value of 79.9μg/m^3 for PM10 and 70μg/m^3 for $PM_{2.5}$. Both values are higher than EU daily limit value and WHO AQG, indicating for an unhealthy air quality. The annual mean ratio of $PM_{2.5}$ /PM10 was 0.61±0.24. During the cold months the average ratio of $PM_{2.5}$ /PM10 results 0.89 against 0.32 in the summer season. The high proportions of PM2.5 within PM10 values demonstrate that fine particles are the greatest contributor to PM air pollution during the winter and suggest that anthropogenic sources have a major influence on such pollution. The high level of PM fractions during winter period can be explained by the extensive use of wood and coal in this city, primarily for heating purposes.

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Cesium and Plutonium in Gulf Waters

The Arabian/Persian Gulf area is a semi enclosed marine water body that is an extension of the Indian Ocean. There is paucity of data on anthropogenic radionuclide from the Indian Ocean region in general (IAEA 2005) and from Gulf in particular. The commissioning of the Bushehr Nuclear Power Plant (BNPP) across the Gulf and others, being built in the United Arab Emirates (UAE) and Saudi Arabia along the Arabian Gulf catchment to meet the increasing energy requirements, necessitates establishment of the baseline levels of anthropogenic radionuclides in seawater to assess marine radionuclide concentration due to normal and fugitive wastewater release and accidental releases, if any.

Previous studies showed that most of the Technologically Enhanced Naturally Occurring Radioactive Material (TENORMs) are low in concentration (Uddin et al. 2015), providing an opportunity to use them as indicators for detecting any systematic or accidental release into the marine environment. The anthropogenic radionuclide ^{137}Cs, ^{238}Pu and $^{239+240}Pu$ are important for assessing radiological contamination in the marine environment due to the substantial inventories and the ecological risk they may pose.

This paper presents the baseline for these radioisotopes in Northern Gulf. The seawater samples were collected from eight stations. Water samples were collected at a depth of 1 m below the sea surface using 5-L Niskin bottles. From each location 100 L of seawater was collected. Putonium sample were prepared using an anion exchange resin. Analytical grade Dowex 1X4 with 200-mesh bead size was used. Plutonium alpha sources were prepared by filtration on micro pore filter. Filters were counted for 4.5 $*10^5$ seconds using alpha

spectrometry system equipped with large size PIPS detector (450 mm^2). Each samples was spiked with 100 µl (47.66 mBq) of ^{236}Pu to assess the recovery. Blank and spiked samples were prepared and analyzed along with the test sample for quality control purposes. The $^{239+240}Pu$ concentration in Kuwait waters was in range of 0.011-0.018 mBq L^{-1} where as the ^{238}Pu range between 0.091-0.170 mBq L^{-1}. The ^{137}Cs range between 0.35-0.90 mBq L^{-1}, which is lower than the concentrations found earlier. The lower concentration is due to the natural decay and effective residence time, suggesting there are no fresh sources. The plutonium concentration are similar to those observed in Mediterranean, East china sea and Northern Indian Ocean.

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Restoration of Lands in Rest using Managed Grazing

Historically a cattle ranch, the Dalles Mountain Ranch was acquired by Washington State Parks in 1994. Within the ranch is a 180-acre parcel of pasture and native range that had been tilled and seeded to 'Secar' bluebunch wheatgrass in 1992. Over time with no management, this parcel degraded and became a monoculture of bluebunch wheatgrass; while it can never be returned to its original state, the overall goal of the restoration/rehabilitation project is to manage the degraded parcel using state-of-the-science management to enhance vegetative diversity while incorporating livestock production, fitting within the "learning ranch" concept of Dalles Mountain Ranch. Dormant season cattle grazing using a holistic management approach began in 2009 and has continued ever since. Pastures of varying sizes were set up and permanent sampling transects and photo points were placed throughout the study area. The permanent sampling transects were used to evaluate vegetative cover, species richness and the reestablishment of grasses and forbs.

After the dormant season managed rotational grazing's; species richness increased overall, vegetative cover of perennial forbs and grasses increased, perennial and annual grass cover decreased while perennial and annual forb cover increased following grazing and perennial forbs increased while litter decreased.

Many challenges (water fencing, weeds, fire) have been overcome throughout the history of this long-term project and this project remains one of the top priorities for degraded rangeland restoration in Washington State.

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Commercial Demonstration of Solid Fuel Production from Municipal Solid Waste by the Hydrothermal Treatment

Up to now, the only commercialized methods of municipal solid waste (MSW) treatment are mass landfilling and mass burning. In Japan, most of burnable wastes are incinerated, but not in other countries, and still landfilling is the most popular way of waste treatment all over the world. But the world recent trend is to prohibit or limit landfilling of wastes while citizens do not want to increase waste incineration in developed countries as well as developing countries. On the other hand, major part of the world is discharging non-segregated municipal solid wastes. Thus we have to find out the utilization ways alternative to incineration for non-segregated MSW. Pre-treatment of wastes requires crushing, drying and deodorizing, which are normally different processes. But we have developed innovative hydrothermal treatment technology (HTT) which can perform these three pre-treatment functions in one process utilizing high-pressure saturated steam. Figure 1 shows the operating principle of HTT. Non-segregated MSW are fed into the reactor, and then, 220℃, 2.5MPa saturated steam is supplied into the reactor for about 30 minutes and the blades installed inside the reactor rotates to mix MSW and steam for about 10 minutes. Then the product is discharged after extracting steam. The product is powder-like substance and the moisture content is almost the same as the raw material, but is easily dried by natural drying. The inert material such as metal, glass and stones can be easily sieved out after drying. There is almost no bad smell in the solid products, and the products can be used as solid fuels which can be easily mixed with coal for power generation or cement production. Only 10-15% of the product is enough for steam production in a boiler. HTT has already commercialized in Japan, China and Indonesia.

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Examination of the Ecological Services of Planted Forests Bordering on Farmlands in Minimizing Leakage of Pesticides

Intensive agriculture includes, among other things, an increased use of pesticides. These are chemicals used in the field for controlling pests, including insects, weeds, fungi and rodents. Due to their widespread use, pesticides have become pollutants of water, air, soil and environment, inducing health risks for humans.

The aim of this study was to examine the role that forests or tree belts planted by the JNF near conventional intensive farmlands have as wind barriers, reducing the transport of atmospheric dust particles containing pesticides. We hypothesized that pesticides transported from agricultural fields and orchards accumulate on the forest trees and on the soil beneath. The study examined the importance of buffer zones created by commonly planted forest trees (*eucalyptus* spp., *Pinus halepensis* and *Ceratonia siliqua*). The methods included analyzing the quantity and the chemical composition of pesticides, carried out by atmospheric dust particles, at different distances from the intensive agricultural fields where pesticides have been implemented. The findings of the study included seventeen chemicalcompounds s, used as insecticides, fungicides and herbicides, found both in the agricultural fields and in the adjacent tree belts. The findings highlight an important function of trees, which has not yet been taken into consideration in policies of planting and afforestation. In an integrated aspect, especially in cases of agricultural fields and orchards, which are adjacent to populated areas, planting forest tree belts should be positively considered as a means for reduction of airborne dust and leakage of pesticides.