

Essays on Environmental Studies

**Edited by
Amit Sarin**

**Athens Institute for Education and Research
2012**

Essays on Environmental Studies

**Edited by
Amit Sarin**

**Athens Institute for Education and Research
2012**

**Essays on
Environmental Studies**

First Published in Athens, Greece by the
Athens Institute for Education and Research.

ISBN: 978-960-9549-75-2

All rights reserved. No part of this publication may be reproduced, stored, retrieved system, or transmitted, in any form or by any means, without the written permission of the publisher, nor be otherwise circulated in any form of binding or cover.

Printed and bound in Athens, Greece by ATINER

8 Valaoritou Street, Kolonaki

10671 Athens, Greece

www.atiner.gr

©Copyright 2012 by the Athens Institute for Education and Research.
The individual essays remain the intellectual properties of the contributors.

Table of Contents

1. Essays on Environmental Studies: An Introduction	1
<i>Amit Sarin</i>	
Part A: Environment and Pollution	
2. Evaluation of Urban Airborne Particulate Matter (PM_{2.5}) in the City of Rio de Janeiro (Brazil) by Mutagenicity Assays	13
<i>Claudia Rainho, Ana Maria Velho, Claudia Aiub, Sérgio Machado Corrêa, José Luiz Mazzei and Israel Felzenszwalb</i>	
3. Contamination of Cadmium and Lead on Iranian Jujube	21
<i>Parisa Ziarati</i>	
4. Geographical and Seasonal Variation of Taxol Content in the Needles of <i>Taxus Baccata</i> L. estimated by High-pressure Liquid Chromatography (HPLC)	29
<i>Angeliki Laiou, Vittorio Vinciguerra, Marco Cosimo Simeone, Federico Vessella, Rosanna Bellarosa and Bartolomeo Schirone</i>	
5. Electromagnetic Fields Generated by Power Transmission Lines in Abu Dhabi Emirate – UAE	41
<i>Muthanna Al Omar, Fadi Al Jallad, Saeed Al Yalyali and Entisar Al Katheeri</i>	
6. Study of the Urban Air Pollution over Stara Zagora, Bulgaria with a Mobile Automatic Station	53
<i>Nikolay Takuchev</i>	
7. Evaluation of Organochlorine Pesticide Residues in Sediments from Gediz and Bakırçay Rivers, Eastern Aegean	61
<i>Filiz Kucuksezgin</i>	
8. Concurrent Biosorption and Biotransformation of Hexavalent Chromium by Immobilized <i>Aspergillus Favus</i> Strain Isolated from Tannery Wastewater	73
<i>Suman Das</i>	
9. Globally Harmonisation System for Classification and Labelling of Mixtures and Consumer Products in Malaysia	83
<i>Letchumi Thannimalay and Sumiani Yusoff</i>	
10. Research of Water-bearing Horizons by Geothermal Methods	95
<i>Irina Abrosimova</i>	
Part B: Optimization of Alternate Energy Resources	
11. Optimization of Biodiesel Production using Reactive Separation Process	105
<i>Apichit Svang-Ariyaskul, Apiwat Rodklai, Michael L. Kallal and Chak-krit Sawangsaensook</i>	
12. Study of the Pyrolysis of Municipal Solid Waste for the Production of Renewable Fuels and Chemicals	115
<i>Inge Velghe, Robert Carleer, Jan Yperman and Sonja Schreurs</i>	

13. Hydrogen Bioproduction with Xylose from Tropical Climate Environmental Sample	127
<i>Sandra I. Maintinguer, Isabel K. Sakamoto, Lorena Lima de Oliveira, Carolina Zampol Lazaro and Maria Bernadete Varesche</i>	
14. Energy Performance of Solar Water Heating Systems in Subtropical Hong Kong	139
<i>Tin-tai Chow and Zhaoting Dong</i>	
15. Modelling Viscosity of Raw Materials for Biodiesel Production	151
<i>Gustavo Anibal Pizarro Bravo Ferreira Lopes, Maria da Conceição Machado Alvim Ferraz, Manuel Afonso Magalhães da Fonseca Almeida, Joana Maia Moreira Dias, Fernando Gomes Martins and José Carlos Magalhães Pires</i>	
16. Highlights of the Studies for the Use of Landfills for Power Generation in Brazil	163
<i>Douglas X. Rezende, Paulo R. Santos, Carlos A. Mariotoni and Tathiane C.Santos</i>	
17. Trnsys Simulation and Optimization of a Solar-thermal Collection and Storage System for the Heating of Agricultural Greenhouses	179
<i>Ignacio R. Martín-Domínguez, José A. Burciaga-Santos, Plinio E. Castro-López and María Teresa Alarcón-Herrera</i>	
18. Phase Diagrams in Agricultural Engineering	191
<i>Abraham Rojano Aguilar, Raquel Salazar Moreno, Waldo Ojeda Bustamante, Uwe Schmidt and Martin Montero Martinez</i>	
19. Ecohydrology Studies Concepts and Principles in Rangeland Ecosystems with a View Subject to Arid and Semi Arid Areas	197
<i>Nasrin Kolahchi</i>	
20. Oily Wastewater Treatment by a Novel Fixed-film Baffled Bioreactor	205
<i>Mehdi Zolfaghari, Manouchehr Vosoughi, Iran Alemzahdeh and Hossein Maazallahi</i>	
21. Design and Product. Eco-compatibility Perception of the Materials and Product	219
<i>Beatrice Lerma, Cristina Allione and Claudia De Giorgi</i>	
22. Building Envelope Design in Terms of Visual and Thermal Comfort in Offices	231
<i>Gülay Zorer Gedik, Rengin Ünver and Esra Sakınç</i>	
Part C: Management of Water and Plants	
23. Investigation of TRIX in the Regulation of the Turkish Marine Aquaculture: Application to the Eastern Aegean Coastal Water (Izmir Bay)	247
<i>Idil Pazi, Guzel Yucel-Gier, Filiz Kucuksezgin and Ferah Kocak</i>	
24. <i>Inula Verbascifolia</i> – Biogeographic Inferences on a Mediterranean Endemic Medicinal Plant	255
<i>Tamara Kirin, Maria Paola Tomasino, Marco Cosimo Simeone, Sandro Bogdanović, Roberta Piredda and Bartolomeo Schirone</i>	

- 25. Optimization of Dry Mechanochemical Conversion Conditions of SrSO₄ to SrCO₃** 265
Deniz Bingol, Salih Aydogan and Seda Karayunlu Bozbas
- 26. Optimal Water Distribution Scenarios using Two Approaches** 275
*Raquel Salazar Moreno, Ferenc Szidarovszky,
Jazmin Zatarain Salazar and Abraham Rojano Aguilar*
- 27. Activation and Characterization of Pyrolysis Chars from Short Rotation Hardwoods** 291
*Mark Stals, Jens Vandewijngaarden, Grazyna Gryglewicz,
Robert Carleer, Sonja Schreurs and Jan Yperman*
- 28. Microbiological Quality of Minimally processed Vegetables Sold in Tirana, Albania** 307
Anjeza Çoku, Mirela Lika and Roland Bani

List of Contributors

Irina Abrosimova, *PhD Student, Kazan (Volga Region) Federal University, Russia*

Abraham Rojano Aguilar, *Professor-Researcher, Autonomous University of Chapingo, México*

Claudia Aiub, *Professor, State University of Rio de Janeiro, Brazil*

Iran Alemzahdeh, *Professor, Chemical and Petroleum Department, Sharif University of Technology, Tehran, Iran*

Cristina Allione, *PhD in Technological Innovation for Architecture and Industrial Design, DIPRADI, Architectural and Industrial Design Department, Politecnico di Torino, Italy*

Manuel Afonso Magalhães da Fonseca Almeida, *Associate Professor, University of Porto, Portugal*

Apichit Svang-Ariyaskul, *Lecturer, Sirindhorn International Institute of Technology, Thailand*

Salih Aydogan, *Associate Professor, Selçuk University, Turkey*

Roland Bani, *Tirana University, Albania*

Rosanna Bellarosa, *Professor, Department of Agriculture, Forests, Nature and Energy, Università degli Studi della Tuscia, Italy*

Deniz Bingol, *Assistant Professor, Kocaeli University, Turkey*

Sandro Bogdanović, *Assistant Professor, University of Zagreb, Croatia*

Seda Karayunlu Bozbas, *Assistant Professor, Kocaeli University, Turkey*

Waldo Ojeda Bustamante, *Researcher, Mexican Institute of Water Technology, México*

Robert Carleer, *Professor, Hasselt University, Belgium*

Tin-tai Chow, *Associate Professor, City University of Hong Kong, China*

Anjeza Çoku, *Biologist, Tirana University, Albania*

Sérgio Machado Corrêa, *Professor, State University of Rio de Janeiro, Brazil*

Suman Das, *Assistant Professor, Charuchandra College, India*

Joana Maia Moreira Dias, *Postdoctoral Student, University of Porto, Portugal*

Ignacio R. Martín-Domínguez, *Research Engineer, Advanced Materials Research Center, Renewable Energy and Environmental Protection Department, Mexico*

Zhaoting Dong, *MPhil Student, City University of Hong Kong, China*

Israel Felzenszwalb, *Associate Professor, State University of Rio de Janeiro, Brazil*

Maria da Conceição Machado Alvim Ferraz, *Lecturer, University of Porto, Portugal*

Gülay Zorer Gedik, *Professor, Yıldız Technical University, Turkey*

Claudia De Giorgi, *Researcher in Industrial Design, DIPRADI, Architectural and Industrial Design Department, Politecnico di Torino, Italy*

Guzel Yucel-Gier, *Professor, Dokuz Eylül University, Turkey*

Grazyna Gryglewicz, *Professor, Wrocław University of Technology, Poland*

María Teresa Alarcón-Herrera, *Research Engineer, Advanced Materials Research Center, Renewable Energy and Environmental Protection Department, Mexico*

Fadi Al Jallad, *Research Engineer, Environmental Studies Department, National Energy and Water Research Center, Abu Dhabi Water and Electricity Authority, Abu Dhabi-UAE*

Michael L. Kallal, *Chemical Engineering Undergraduate Students, Sirindhorn International Institute of Technology, Thailand*

Entisar Al Katheeri, *Senior Research Engineer, Environmental Studies Department, National Energy and Water Research Center, Abu Dhabi Water and Electricity Authority, Abu Dhabi-UAE*

Tamara Kirin, *PhD Student, Università della Tuscia, Italy*

Ferah Kocak, *Professor, Dokuz Eylul University, Turkey*

Nasrin Kolahchi, *PhD Student, Department of Range Management, Science and Research Branch, Islamic Azad University, Tehran, Iran*

Filiz Kucuksezgin, *Professor, Dokuz Eylul University, Turkey*

Angeliki Laiou, *PhD Student, Department of Agriculture, Forests, Nature and Energy, Università degli Studi della Tuscia, Italy*

Carolina Zampol Lazaro, *PhD Student, University of São Paulo, Brazil*

Beatrice Lerma, *PhD in Production System and Industrial Design, DIPRADI, Architectural and Industrial Design Department, Politecnico di Torino, Italy*

Mirela Lika, *Tirana University, Albania*

Plinio E. Castro-López, *Student, Advanced Materials Research Center, Renewable Energy and Environmental Protection Department, Mexico*

Gustavo Aníbal Pizarro Bravo Ferreira Lopes, *Master in Environmental Engineering, University of Porto, Portugal*

Hossein Maazallahi, *B.Sc. Student, Sharif University of Technology, Tehran, Iran*

Sandra I. Maintinguer, *PhD, University of São Paulo, Brazil*

Carlos A. Mariotoni, *Professor, Campinas State University, Brazil*

Martín Montero Martínez, *Researcher, Mexican Institute of Water Technology, México*

Fernando Gomes Martins, *Lecturer, University of Porto, Portugal*

José Luiz Mazzei, *Chemistry, State University of Rio de Janeiro, Brazil*

Raquel Salazar Moreno, *Professor-Researcher, Autonomous University of Chapingo, México*

Lorena Lima de Oliveira, *PhD, University of São Paulo, Brazil*

Muthanna Al Omar, *Manager, National Energy and Water Research Center, Abu Dhabi Water and Electricity Authority, Abu Dhabi-UAE*

Idil Pazi, *Professor, Dokuz Eylul University, Turkey*

José Carlos Magalhães Pires, *Postdoctoral Student, University of Porto, Portugal*

Roberta Piredda, *PhD, Researcher, Università della Tuscia, Italy*

Claudia Rainho, *PhD Student, State University of Rio de Janeiro, Brazil*

Douglas X. Rezende, *Engineering Student, Campinas Anhanguera Faculty, Brazil*

Apiwat Rodklai, *Chemical Engineering Undergraduate Students, Sirindhorn International Institute of Technology, Thailand*

Isabel K. Sakamoto, *PhD, University of São Paulo, Brazil*
Esra Sakınç, *Dr., Yıldız Technical University, Turkey*
Jazmin Zatarain Salazar, *Finish Master Degree, The Autonomous University of San Luis Potosi, in México*
José A. Burciaga-Santos, *Student, Advanced Materials Research Center, Renewable Energy and Environmental Protection Department, Mexico*
Paulo R. Santos, *Professor, Campinas Anhanguera Faculty and Post-Graduation Student, Campinas State University, Brazil*
Tathiane C. Santos, *Professor, Campinas Anhanguera Faculty, Brazil*
Amit Sarin, *Associate Professor, Amritsar College of Engineering & Technology (NBA Accredited), India*
Chak-krit Sawangsaensook, *Chemical Engineering Undergraduate Students, Sirindhorn International Institute of Technology, Thailand*
Bartolomeo Schirone, *Professor, Department of Agriculture, Forests, Nature and Energy, Università degli Studi della Toscana, Italy*
Uwe Schmidt, *Professor, Vice Dean and Head of Division Biosystem Engineering Division, Faculty for Agriculture and Horticulture, Humboldt University of Berlin, Germany*
Sonja Schreurs, *Professor, XIOS University College, Belgium*
Marco Cosimo Simeone, *Researcher, Department of Agriculture, Forests, Nature and Energy, Università degli Studi della Toscana, Italy*
Mark Stals, *Dr., Hasselt University, Belgium*
Ferenc Szidarovszky, *Professor, University of Arizona, USA*
Nikolay Takuchev, *Lecturer, Trakia University, Bulgaria*
Letchumi Thannimalay, *Senior Researcher, University of Malaya, Department of Civil Engineering, Malaysia*
Maria Paola Tomasino, *PhD Student, Università della Toscana, Italy*
Rengin Ünver, *Professor, Yıldız Technical University, Turkey*
Jens Vandewijngaarden, *M.Sc, Hasselt University, Belgium*
Maria Bernadete Varesche, *Professor, University of São Paulo, Brazil*
Inge Velghe, *PhD Student, Hasselt University, Belgium*
Ana Maria Velho, *MSc Biologist, State University of Rio de Janeiro, Brazil*
Federico Vessella, *Post-Doc, Department of Agriculture, Forests, Nature and Energy, Università degli Studi della Toscana, Italy*
Vittorio Vinciguerra, *Researcher, Department for Innovation in Biological, Agro-Food and Forest Systems (DIBAF), Università della Toscana, Italy*
Manouchehr Vosoughi, *Professor, Sharif University of Technology, Tehran, Iran*
Saeed Al Yalyali, *Assistant Research Engineer, Renewable Energy Department, National Energy and Water Research Center, Abu Dhabi Water and Electricity Authority, Abu Dhabi-UAE*
Jan Yperman, *Professor, Hasselt University, Belgium*
Sumiani Yusoff, *Associate Professor, University of Malaya, Department of Civil Engineering, Malaysia*
Parisa Ziarati, *Islamic Azad University, Pharmaceutical Sciences Branch (IAUPS), Tehran, Iran*
Mehdi Zolfaghari, *M.SC. Student, Sharif University of Technology, Tehran, Iran*

1

Essays on Environmental Studies: An Introduction

Amit Sarin, Amritsar College of Engineering & Technology, India

This book is a collection of papers presented at the conference organized by the Athens Institute for Education and Research (ATINER), held in Athens. The papers are organized into three parts. The first part includes papers on environment and pollution, the second part includes papers on optimization of alternate energy resources and the last part includes management of water and plants. In this introductory note of the book, each part is briefly presented.

Environment and Pollution

The energy generated from the combustion of fossil fuels and other sources has indeed enabled many technological advancements and social-economic growth which otherwise may be impossible. However, it simultaneously creates many environmental concerns which can threaten the sustainability of our ecosystem. The use of fossil fuels is one of the major sources of world wide environmental pollution, the green house effect and acidification of both soil and water. Also, the rising prices of oil and gas and potential shortage in future lead to concern about the security of energy supply needed to sustain our economic growth.

In the first chapter, Claudia Rainho, Ana Maria Velho, Claudia Aiub, Sérgio Machado Corrêa, José Luiz Mazzei, and Israel Felzenszwalb present the report of the investigation of the presence of mutagenic activity using *Salmonella/microsome* assay (described by Kado) on samples of particulate matter performed collected at three sites (Brasil Avenue, Rebouças Tunnel and in Rio de Janeiro University State – UERJ Campus - low traffic) in Rio de Janeiro city between April and July 2010. Each of the PM_{2.5} samples (4) were collected on glass filters using high-volume collector (AVG MP 2.5) for 24h in Brasil Avenue and UERJ campus. In Rebouças Tunnel each sample (4) was collected for 6h. The filters were pooled to obtain monthly samples. Half of

each filter containing particulate matter was submitted for extraction sequentially by sonication with dichloromethane. Prior to bioassay performance, the organic extract was dried at 4°C and resuspended in dimethyl sulfoxide. For each sample *S. typhimurium* TA98 (frameshift strain) was used, with and without metabolization (S9 mix), beside the derivative strains TA98DNP₆ (transacetylase deficient), YG1021 (nitroreductase-overproducing) and YG1024 (*O*-acetyltransferase-overproduction). Five concentrations from each sample (10-50 µg / plate) were tested in triplicate. Results were expressed as a mutagenic index (MI) which is equal to the ratio between the number of *His*⁺ induced in the sample and the number of spontaneous *His*⁺ in the negative control. For both month positive mutagenicity results were detected, both in the presence and absence for S9 mix, in Brasil Avenue (M.I. 2.08 - 7.05) and Rebouças Tunnel (M.I. 2.1 - 23.39), especially in the YG1024, suggesting the presence of high concentration of nitroderivates PAHs in those sites.

Chapter two deals with the contamination of cadmium and lead on Iranian jujube. Parisa Ziarati research indicates that consumers are purchasing jujube with high levels of heavy metals(HMs) and it is suggested that medicinal plants used for human consumption or for preparation of herbal products and standardized extracts should be collected from an unpolluted natural habitat.

In the next chapter, Angeliki Laiou, Vittorio Vinciguerra, Marco Cosimo Simeone, Federico Vessella, Rosanna Bellarosa and Bartolomeo Schirone elucidate the effect of vegetative period, sex and provenance on the Taxol content from the needles of Yew tree. A considerable variation has been found between the different European provenances (Atlantic and Mediterranean) as well as within the natural population of *T. baccata* L. trees growing in Italy in relation to different sex. The highest quantity of Taxol was found in Azores while the lowest in an Italian field.

Muthanna Al Omar, Fadi Al Jallad, Saeed Al Yalyali, and Entisar Al Katheeri write about the electromagnetic fields generated by power transmission lines in Abu Dhabi Emirate-UAE in the next chapter This research work was done to measure the strength of electric and magnetic fields in Abu Dhabi Emirate during 2010, using electric and magnetic field analyzers. Measurements were done under 400, 220 and 132 kV power lines as the hot spots and in different communities and natural ecosystems to represent the background levels. Measurements showed that the highest values for electric fields strengths were found to be $7.41 \pm 3.94 \text{ kV.m}^{-1}$, $5.454 \pm 2.691 \text{ kV.m}^{-1}$ and 2.769 kV.m^{-1} for 400, 220, and 132 kV power lines respectively, whereas the highest magnetic flux density were $2.456 \pm 1.226 \text{ µT}$, 2.223 ± 2.036 and 0.216 µT for the three types of power lines. EMFs in residential areas showed electric field strength to be $25.64 \pm 62.99 \text{ V.m}^{-1}$ and magnetic average flux density was $30.49 \pm 23.96 \text{ nT}$, both average values were considerably low. The background measurements in natural ecosystems showed an average electric field strength of $2.12 \pm 2.623 \text{ V.m}^{-1}$ and magnetic flux density of $1.194 \pm 1.183 \text{ nT}$. Levels reported both in residential area and natural ecosystems were far below the guideline values of international organizations also they were below the limit of childhood leukemia which is 0.4 µT .

In the fifth chapter, Nikolay Takuchev writes about the urban air pollution over Stara Zagora, Bulgaria with a mobile automatic station. In the next chapter, Filiz Kucuksezgin Evaluates organochlorine pesticide residues in sediments from Gediz and Bakırçay Rivers, Eastern Aegean. Suman Das writes about in the seventh chapter about the concurrent biosorption and biotransformation of hexavalent chromium by immobilized *Aspergillus flavus* strain isolated from tannery wastewater.

Letchumi Thannimalay and Sumiani Yusoff write about the GHS classification for mixtures that includes consumer products was carried out using the GHS toolkit in the next chapter. Comparison between experimental data or manual classification with GHS Toolkit were conducted to know the accuracy of the Toolkit. The toolkit was able to produce mandatory labels that were required by the local and international regulations. Manual classifications are time consuming and high tendency to make mistakes during classifications. Conventional product classifications using experimental data are expensive. Manual classifications and experiments can be replaced by the GHS Toolkit. The output of the GHS toolkit shows that the toolkit is very accurate, fast, robust, reliable in classification and labelling of products or mixtures. Consumers that have a very little knowledge on classification and labelling can use the toolkit to choose a not hazardous product. The manufacturer can also use the GHS toolkit to formulate products that does not contain any hazardous properties.

In the last chapter of the first part of the book, Irina Abrosimova writes about the Geothermal methods used to study the thermal regime of the Earth's interior. Investigation of spatial changes in temperature and convective heat flow made it possible to make a number of conclusions, and the main ones are the following. The main characteristics of the hydrogeothermal region regime are the boundary depth separating the zone of influence of underground waters on temperature field. Convective heat flow in the permeable horizons along the section decreases with depth. In places where infiltration waters penetrate to greater depth, the temperatures are anomalously low. The results obtained not only prove the correlation of the rock temperature to penetration depth of infiltration waters, but also confirm a more fundamental conclusion that hydrogeological disturbance is one of the main factors that influence temperature field in upper layers of the Earth's crust. So, the data of geothermal measurements allow to determine the hydrogeological characteristics such as infiltration and discharge zones, direction of groundwater movement, the degree of hydrogeological layer openness or closeness, local aquifuges and filtration rate of groundwater. This information can be used to control the pollution of the underground waters.

Optimization of Alternate Energy Resources

The high energy demand in the industrialized world and pollution problems caused due to widespread use of fossil fuels make it necessary to develop and optimize the renewable energy sources of limitless duration and smaller environmental impact than the traditional one. Mainstream forms of renewable energy include wind power, hydropower, solar energy, biomass, and biofuels. Airflows can be used to run wind turbines. Modern wind turbines range from around 600 kW to 5 MW of rated power, although turbines with rated output of 1.5–3 MW have become the most common for commercial use. Energy in water can be harnessed and used. Solar energy is the energy derived from the sun through the form of solar radiation. Solar powered electrical generation relies on photovoltaics and heat engines. A partial list of other solar applications includes space heating and cooling through solar architecture, daylighting, solar hot water, solar cooking, and high temperature process heat for industrial purposes. Biomass (plant material) is a renewable energy source because the energy it contains comes from the sun. Through the process of photosynthesis, plants capture the sun's energy. When the plants are burned, they release the sun's energy they contain. In this way, biomass functions as a sort of natural battery for storing solar energy. As long as biomass is produced sustainably, with only as much used as is grown, the battery will last indefinitely.

In the first chapter of this second part of the book, Apichit Svang-Ariyaskul, Apiwat Rodklai, Michael L. Kallal, and Chak-krit Sawangsaensook write about the Optimization of biodiesel production using reactive separation process. Their work focus on the optimization of biodiesel production using integrated reactive separation process compared with a separated set of reaction and separation process to produce highest product yield and purity while costing lowest capital and operating costs. The reactive separation process focus on reactive absorption which is quite new compared to reactive distillation. Feed stock came from bio-oil available in Thailand. Two types of catalysts, acid and basic, were used to determine the optimal reaction kinetics. Process technical and economical feasibilities were evaluated. The integrated process efficiency was compared to the conventional process. The results showed that the integrated reactive separation process is promising and is more efficient than the conventional process in both product yield and purity and production cost.

Inge Velghe, Robert Carleer, Jan Yperman and Sonja Schreurs discuss about the pyrolysis in the second chapter of this part. Pyrolysis experiments of municipal solid waste (MSW) are carried out in a semi-batch reactor under inert nitrogen atmosphere. Slow pyrolysis – characterized by long residence time (2 hours), heating rate of 4°C/min with sand acted as heat transfer medium- is performed till 550°C. Fast pyrolysis - characterized by short residence time (few minutes), high heating rate with sand acted as heat transfer medium- is performed at 450, 480, 510 and 550°C and different input transfer

rates (12 or 24g MSW/min). The pyrolysis products are studied on composition and yield/distribution and investigated for their use as fuel or raw chemical feedstock. Slow pyrolysis liquids can be separated in a water rich and a water poor oil product. For all fast pyrolysis conditions, MSW decomposes to viscous, brown oil which contains a poly (ethylene-co-propylene) wax. Composition analysis by GC/MS of the oil products (slow/fast) shows that aliphatic hydrocarbons are the major compounds, which can be interesting as a chemical feedstock fraction. The pyrolysis oils have high caloric, low wt% of water and low O/C values. These properties made the oils promising as fuel. The attempt to converse the waxy material by decreasing input transfer rate is only sufficient at fast pyrolysis temperature 510°C. The waxy material can have possibilities for applications as paraffin wax or can be upgraded to lighter (fuel) fractions. The optimal pyrolysis condition, regarding to oil yield, fuel properties, and wax yield is fast pyrolysis at 510°C with 24g material/min input transfer rate.

The pyrolysis gasses produced are energetic rich HC gasses. In addition, the main gasses can be valuable within the chemical industry. ICP-AES analysis of pyrolysis products reveals that inorganic compounds present in MSW are mostly distributed in the solid fraction. In view of recycling of metals in industry, elemental metallic compounds present in the solid fraction can be easily removed through sieving. In conclusion it should be stated that MSW has potential as chemical feedstock as such and certainly after upgrading.

In the third chapter, Sandra I Maintinguer, Isabel K Sakamoto, Lorena Lima de Oliveira, Carolina Zampol Lazaro, and Maria Bernadete Varesche deals with the hydrogen bioproduction with Xylose from tropical climate environmental. Tin-tai Chow and Zhaoting Dong in the next chapter, reports the energy performance of solar water heating systems in subtropical Hong Kong.

Next chapter about the modelling of the viscosity of raw materials for biodiesel production is written by Gustavo Aníbal Pizarro Bravo Ferreira Lopes, Maria da Conceição Machado Alvim Ferraz, Manuel Afonso Magalhães da Fonseca Almeida, Joana Maia Moreira Dias, Fernando Gomes Martins and José Carlos Magalhães Pires. Douglas X. Rezende, Paulo R. Santos, Carlos A. Mariotoni and Tathiane C. Santos highlight the studies for the use of landfills for Power Generation in Brazil. Brazil, together with Russia, India and China form the BRIC, a group of countries that currently has the highest rates of economic development in the world. It is expected that continue a very strong economic growth in those countries in the beginning decade. In order to support this growth, Brazil needs additions of about 4,000 MW/year in the electric system. The hydroelectric sources are proving to be the best solution for support the increase in the demand, but this alternative has environmental negative effects. Renewable sources, with low costs and satisfactory levels of pollution, may help the National Energy Grid. Nowadays, Brazil has about 194 million of people and has been registering 4 - 6% of GDP

(Gross Domestic Product) per year. This paper analyzes opportunities of exploitation of methane gas produced in landfills for power generation in Brazil. For this, was studied the use of the methane gas for electricity generation, the average composition of the garbage, and a place in São Paulo City that convert gas in electricity. It was found that Brazilian waste has 55% of organic material, which is useful for electricity generation in small scale and it was also found that Brazil has 26 cities where this kind of use is possible. The use of landfills can avoid CO₂ emission and also generate carbon credit, but in Brazil all kind of generation concurs with hydroelectric power plants, so the landfills use needs public policies to warrant the investments and to create a culture of this use in the country.

Seventh chapter written by Ignacio R. Martín-Domínguez, José A. Burciaga-Santos, Plinio E. Castro-López, and María Teresa Alarcón-Herrera deals with the Trnsys simulation and optimization of a solar-thermal collection and storage system for the heating of agricultural greenhouses. In the Eight chapter by Abraham Rojano Aguilar, Raquel Salazar Moreno, Waldo Ojeda Bustamante, Uwe Schmidt, and Martin Montero Martinez show the total energy found in controlled agriculture as a function of its components under different conditions located in México. The strong differences of heat capacity between dry air and vapor makes feasible to storage a significant amount of energy as temperature increases. Since rational knowledge of the laws of the nature and the technological limitations requires knowing the role temperature and humidity, thus the enthalpy with three different diagrams alike: T-H diagram, Mollier and Carrier diagrams in a 2D framework. As a result, decisions to handle an intensive agricultural system inside the ideal levels of production are suggested.

The next chapter, Ecohydrology studies concepts and principles in rangeland ecosystems with a view subject to arid and semi arid areas is written by Nasrin kolahchi. Researcher writes that on the beginning of twenty-first century, the water crisis in the Priority Policy and Management is located in and outside the country as a principle thoroughly human, social, economic and political rulers of the country is considered abundant. The Economy World Bank has announced that the during 1960 and 2025 , water resources rate in Middle East , from 3430 m³ for the each person in year reach to 667 m³ . population growth, degradation of natural resources, extent and spread of deserts in this effect is known. Water resource management considering the real dynamics or in other words ecohydrology basins including the latest techniques in water resources management around the world. Therefore, in rangelands as broadest and most complex ecosystems, ecohydrology represents a new approach in water resources management.

The chapter oily wastewater treatment by a novel fixed-film baffled bioreactor by Mehdi Zolfaghari, Manouchehr Vosoughi, Iran Alemzahdeh, and Hossein Maazallahi emphasize that the oil refineries, petrochemical factories and oil platforms produce a large amount of oily wastewater every day. Although, tradition biological treatment plants of oily wastewaters is a well-established method for remediation of these wastes, there are many problem

associate with conventional systems such as Activated Sludge. We have designed a new bioreactor system to increase the efficiency of treatment by allowing greater organic loads, changing the reactor configuration, increasing microbial concentration by using attached and suspended bacteria, and increasing stability and resistance to hydraulic and organic shocks. Novel media used in this Fixed-Film bioreactor provides a high surface area-to-volume ratio ($600 \text{ m}^2/\text{m}^3$) which increases MLSS in the reactor. Reactor Biodegradability for COD (Chemical Oxygen Demand) and TPH (Total Petroleum Hydrocarbon) is evaluated for different Hydraulic Retention Time and oil pollution concentration. The best COD and TPH removal is reported in TPH= 300 mg/L in HRT= 48 hr, but optimized performance is reported in HRT= 24 hr and TPH= 300 mg/L. Existing CAS (Conventional Activate Sludge) plants can be upgraded by changing the reactor configuration and introducing support media into aeration tank.

In the next chapter, Beatrice Lerma, Cristina Allione, and Claudia De Giorgi deal with the Design and product. Eco-compatibility perception of the materials and product. In the last chapter of the second part of the book, Building envelope design in terms of visual and thermal comfort in offices was investigated by Gülay ZORER GEDİK, Rengin ÜNVER, and Esra Sakınç. In the study, three different room dimensions, three different window types and four different wall constructions are chosen considering the materials used mostly in Turkey. Each room has single facade oriented to the cardinal directions with one window on it. Calculations are made for obstructed and unobstructed office buildings. From the view point of the visual comfort, daylight illuminances on the working plane are calculated for different facade features according to the average sky model. Investigation of the envelope alternatives in terms of heat, covers checking the internal surface temperatures and interstitial condensation of the external wall constructions and calculation of the heating energy consumption of the rooms.

Management of Water and Plants

In the first chapter of this last part of the book, Idil Pazi, Guzel Yucel-Gier, Filiz Kucuksezgin and Ferah Kocak write about the Investigation of TRIX in the regulation of the Turkish marine aquaculture: Application to the Eastern Aegean Coastal water (Izmir Bay). Coastal aquaculture is widespread in Turkey and there is a need for proper coastal space management among the different users of the coastal zone. In Turkey, an Environmental Impact Assessment is a legal requirement for any marine aquaculture development. A new legislation was enacted about “Rearrangement of establishing fish farms in the closed bay and gulf qualified sensitive areas due to recent criteria in 2007” by the Ministry of Environmental and Forestry of Turkey. The objective of this study is to emphasize and review the environmental laws related to the TRIX, which can be counted as recent criteria for marine aquaculture activity in the

Izmir Bay. The seasonal mean value of TRIX was 2.5 in the Outer Bay. In the Inner Bay, mean TRIX value (4.3) which is above the threshold of four and typical for high eutrophication risk areas. Inner Bay become very productive (eutrophic) and it is sensitive to eutrophication phenomena during the year. The trophic status of the aquaculture area (mean TRIX: 3.6) indicates no risk of eutrophication as defined by Turkish law. The study then applied the UNTRIX indices adjusted to local conditions, revealing that both the inner bay and the aquaculture area (AA) can be classified as of poor status whereas the outer bay can be defined as good. The UNTRIX-based trophic classification is in good agreement with TRIX for both the outer and inner parts of the bay; however, there is no agreement regarding the classification of the aquaculture area.

In the next chapter, Tamara Kirin, Maria Paola Tomasino, Marco Cosimo Simeone, Sandro Bogdanović, Roberta Piredda, and Bartolomeo Schirone deal with the *Inula verbascifolia* – biogeographic inferences on a Mediterranean endemic medicinal plant. *Inula verbascifolia* (Willd.) Hausskn. (Asteraceae) is an herbaceous perennial plant. Many species in this genus are used in herbal medicine⁽²⁾ but interest for *I. verbascifolia* is increasing since cytotoxic agents, germacranolides, were isolated from one of its subspecies (*I. verbascifolia* subsp. *methanea*)⁽¹⁾. This is why in this work we would like to provide a molecular insight on the taxonomy of this group. Center of its distribution is Greece, where several subspecies are recorded. The northernmost border of the species' range is the Mediterranean coast of Croatia, one of the most species-rich area of Europe. The taxon is also present in Italy on the Gargano peninsula, another Mediterranean hotspot of biodiversity. Phylogenetic relationships among taxa of *I. verbascifolia* were inferred from plastid DNA sequences (*trnH-psbA*). Tested populations were sampled in Croatia, Italy and Greece. We found interesting patterns of intra-specific polymorphism. The Greek population was genetically notably different from all the others. Interestingly, one population in Croatia and both ones in Gargano shared the same DNA insertion. These results indicate the existence of a great variability among the populations of *I. verbascifolia*.

Deniz Bingol, Salih Aydogan, and Seda Karayunlu Bozbas Optimize dry Mechanochemical conversion conditions of SrSO₄ to SrCO₃ in the next chapter. Celestite occurs in nature and is used as the major starting material for the production of strontium compounds. Celestite is converted to SrCO₃, the common commercial form of strontium by different methods. The optimization of dry mechanochemical conversion conditions of celestite to strontium carbonate using ammonium carbonate were made by design of experiments. Two variables (rotational speed of mill and (NH₄)₂CO₃/SrSO₄ mole ratio) were regarded as factors in the optimization. The experimental optimization step was performed by a three-level full factorial design. The rotational speed of mill was found as the most significant factor that affected the conversion. The three-level full factorial design was successfully applied to the dry conversion of celestite, SrSO₄, to SrCO₃ using ammonium carbonate in a planetary type ball mill. A 98% conversion of celestite to SrCO₃ was obtained in 400 rpm by increasing the mole ratio of (NH₄)₂CO₃/SrSO₄ to 2:1.

The fourth chapter optimal Water Distribution Scenarios using Two Approaches is written by Raquel Salazar Moreno, Ferenc Szidarovszky, Jazmin Zatarain Salazar, Abraham Rojano Aguilar. The next chapter by Mark Stals, Jens Vandewijngaarden, Grazyna Gryglewicz, Robert Carleer, Sonja Schreurs and Jan Yperman deals with the activation and characterization of Pyrolysis Chars from short rotation hardwoods. Chars from fast and flash pyrolysis of three short rotation hardwoods (i.e. *S. fragilis*, *P. Grimminge* and *P. nigra*) are used as precursor material for the preparation of activated carbons (AC). Physical activation using steam and chemical activation with potassium hydroxide are performed, resulting in 12 different AC. Char and AC yields are calculated and the obtained AC are characterized. Nitrogen adsorption at 78 K is applied to obtain the equivalent surface area and information concerning the pore structure. Methylene blue (MB) and iodine adsorption experiments have been performed to gain additional information on the AC's adsorption properties. A commercial AC (Norit GAC) is used as reference. Nitrogen adsorption shows large equivalent surface areas of up to 3800m²/g. All activated carbons have a well developed microporous structure, and in the case of physical activation, some mesoporosity is also present. Langmuir and Freundlich adsorption models are applied on the methylene blue adsorption data. The Langmuir isotherm shows a better fit than the Freundlich isotherm. In all cases, chemical activation yields a higher adsorption capacity than physical activation. All AC (except for one) adsorb at least 70% of their maximum MB adsorption capacity within 15 minutes. The highest MB uptake obtained is 727 mg of MB adsorbed per gram AC while the reference adsorbs 246 mg of MB per gram AC. A good iodine uptake is observed. Chemical AC shows a higher iodine adsorption than physical AC. Highest iodine uptake observed is 2913 mg iodine per gram AC while the reference adsorbs 1198 mg iodine per gram AC. These findings illustrate that fast and flash pyrolysis chars from short rotation hardwood are a promising precursor for activated carbon production.

The last chapter of the book deals with the microbiological quality of minimally processed vegetables sold in Tirana, Albania. This chapter is authored by Anjeza Çoku, Mirela Lika, and Roland Bani. Minimally processed vegetables go through different steps during their preparation. However, they must maintain the same quality as the fresh products. The aim of this study is to survey the microbial quality of minimally processed vegetables, because the health of consumers can be affected by consumption of microbiologically unsafe food. Microbial contamination can occur directly or indirectly during human handling, peeling, washing, preservation, transport. A survey of minimally processed vegetables in Tirana city is conducted during 2010.

A total of 115 vegetables and salad samples, were analyzed for presence of MAM, for total coliforme, presence of *E.coli* and other pathogens related to vegetables. The samples were collected casually at different areas of Tirana city. The results indicate that minimally processed vegetables sold in different markets of Tirana city, over 70 % had good microbiological quality. *Enterobacteriaceae* populations between 10⁵ and 10⁶ CFU/g were found in 12

Essays on Environmental Studies

% of samples. *Citrobacter freundii* was found in 8 vegetable samples. *Serratia ficaria* was found in 6 vegetable samples. *Enterobacter agglomerans* was found in 7 cases, *Listeria spp* was found in 3 vegetable samples, *Bacillus cereus* was found in 2 salad sample and *E.coli O157* were not found.

Acknowledgements

The editor of this book would like to thank the Athens Institute of Education and Research (ATINER) especially to Dr. Gregory T. Papanikos, President ATINER and for all the staff support during the development of this publication. Last but not least I am grateful to all the contributors for sharing their wonderful research work.