Program And Abstracts

THE 17TH INTERNATIONAL INTERDISCIPLINARY CONFERENCE ON THE ENVIRONMENT

JUNE 29-JULY 3, 2011
KONA, HAWAII

Organized By
The Interdisciplinary Environmental Association

WELCOME

Dear Participant:

On behalf of the Interdisciplinary Environmental Association, I would like to welcome you to Kona, Hawaii and the 17th International Interdisciplinary Conference on the Environment. Here in the middle of the dynamic Pacific Ocean we find an outpost of life in extravagant form. Yet even here in this island paradise, conflicts arise been the needs of the natural ecosystems and the needs and wants of humanity. We look forward to learning more about these dynamic challenges and other examples from around the globe. Looking over this program, I am sure that you will be impressed with the breadth of locations and topics awaiting us over the next few days.

Each year we attempt to bring together specialists, practitioners, and interested citizens from all corners of the globe in order to exchange ideas and approaches to the environmental issues that we face. It is an underlying philosophy of this organization and this conference that we have the best chance for success in our attempts to both understand and address environmental issues when we are free to discuss them without limitations to particular philosophies, political boundaries, or disciplinary constraints. If this is a return trip to our conference for you, I hope that you find us more vital and active than you remember. If this is your first IICE conference, I hope that you will find our unusual (even distinctive) approach to environmental work highly challenging and stimulating, and that you will be able to find ways to network with our membership around the globe to mutual benefit. And if you get caught up in what you experience at the IICE, I hope that you will consider joining the Interdisciplinary Environmental Association and becoming a part of the effort we are building.

Good luck in your sessions, I look forward to meeting each of you, and Welcome to Kona and the 17th IICE!

Eric J. Fitch
President, 2009-2011

Kimberly Reiter
VP and President-Elect

The Interdisciplinary Environmental Association
www.ieaonline.org

CONFERENCE SCHEDULE SUMMARY

7:30 AM	Wednesday June 29	Thursday June 30	Friday July 1	Saturday July 2	7:30 AM
		Registration (to 3PM): Keauhou I	Registration (to 10am) Keauhou I	Gather Keauhou I	
8:00					8:00
		Session 1: Waste and Human Health Keauhou 3	Session 8: Managing Water for Human Need Keauhou 3	Session 15: Wetlands and Stream Restoration Keauhou 3	
8:30					8:30
9:00		Session 2: Grassroots Community Intervention... Keauhou 4	Session 9: New Applications of Sustainability Philosophy Keauhou 4		9:00
9:30					9:30
10:00		Break Keauhou 1	Break Keauhou 1	Break Keauhou 1	10:00
10:30		Session 3: Industrial Pollution and the Land Keauhou 3	Session 10: Microbial Ecosystem Fermentation as a Revenue-Generating… Keauhou 3	Session 16: Greening the Built Environment Keauhou 3	10:30
11:00					11:00
		Session 4: Ecotourism Keauhou Ballroom 3	Session 11: Cooperation in Decision Making for Management Keauhou 4	Session 17: Planning for Disaster and Conflict Keauhou 4	
11:30					11:30
12:00 PM					12:00 PM
			Conference Luncheon Tropical Terrace		
12:30		Lunch On Your Own			12:30
			Presidents' Addresses: Eric Fitch – Outgoing Kimberly Reiter - Incoming		
1:00					1:00
1:30					1:30
		SPECIAL SESSION			
2:00			SPECIAL SESSION		2:00
		Session 5: Open Roundtable Towards an Interdisciplinary Curriculum Keauhou 1	Session 12: UHM Sustainability Courtyard as a Center for Campus Engagement Keauhou 1		
2:30					2:30
3:00				Place of Refuge Field Trip	3:00
		Session 6: Costs of Mining Keauhou 3			
3:30			Session 13: Impacts of Population Growth on Resources		3:30
		Session 7: Dealing with the Ocean Keauhou 4			
4:00			Session 14: Risk Assessment and Management		4:00
4:30		Break Keauhou I			4:30
5:00		KEYNOTE			5:00
		Developing Alternative Energy Approaches in Hawaii: Realizing the Paradigm Shift and Its Meaning for Pacific Island Systems William Steiner Keauhou I	IEA Business Meeting Keauhou I		
5:30					5:30
6:00					6:00
6:30					6:30
evening	Social Mixer, 7-9PM				

Conference Keynote Address: Dr. William Steiner

Dr. William Wallace Mokahi Steiner has served as Dean for the College of Agriculture, Forestry and Natural Resource Management at the University of Hawai‘i at Hilo since 2005. As visionary, financial, and academic manager for the college, Dr. Steiner has developed new research thrusts into biofuel development, heritage foods development, and dairy sciences while developing the equine sciences program. His intention is to move the college forward into a future that embraces a growing forestry industry and work in the fields of sustainable agriculture.

Prior to his appointment as Dean, Dr. Steiner served for 22 years in U.S. federal research, first as a scientist for the USDA Agricultural Research Service in Columbia, Missouri, then as director for the USGS Pacific Islands Ecosystem Research Center (PIERC) in Honolulu, where he oversaw the start of the Center in 1995 and federal research into natural resource management and conservation for states and territories under U.S. jurisdiction within the Pacific Basin. Prior to this, he served as an assistant professor at the University of Illinois at Champaign-Urbana, and as an Associate Professor at the University of Missouri at Columbia. He earned his Ph.D. in Genetics at the University of Hawai‘i at Manoa (UHM) in 1974, a Bachelor’s in Zoology from UHM in 1970, and an A.S. in Agriculture from Boise State before transferring to Hawai‘i. His scientific career has resulted in over ninety publications, numerous professional presentations, and one book.

Dr. Steiner was born in Honolulu to a mother whose roots trace back to three Hawaiian ‘ohana—the Haleakala family on Maui, the Punahele family on Kaua‘i, and the Haili family on Hawai‘i Island. His father is descended from a long line of Swiss homesteaders and mechanically-minded people. Dr. Steiner grew up on the family’s 16,000-acre ranch in Owyhee County Idaho where he attended one and two room schools and a very small high school. While in Missouri, he bought and operated a 160-acre organic and draft-horse farm which he still owns.

Dr. Steiner writes poetry and songs in his spare time and is self-taught on the guitar. An inveterate observer of people and culture, Dr. Steiner finds human diversity and behavior fascinating and believes that one of our biggest threats is the loss of cultural diversity. He recognizes that cultural diversity is a result of environmental diversity, and that loss of natural resources threatens the base upon which humanity is derived.

17th IICE Keynote Address:

Developing Alternative Energy Approaches in Hawaii: Realizing the Paradigm Shift and Its Meaning for Pacific Island Systems

A national paradigm shift is taking place that gives insight into the factors that influence it. Like those associated with the shift in social communication brought by the web, it begins slowly but is rapidly catching on. This shift involves the use and sources of energy, and cost is driving the change. This can be good for those who trust theories about GCW, with possible exceptions, because the final word is not yet in on what the exact impacts will be as alternative energy choices are made. Nevertheless, the issues addressed by this conference all play a role in choice and impact. From broad environmental issues to island resource issues to ethics and environmental health, the change is broader than many realize and is bound to impact policy choices. I use several choices of alternative energy (oil palm, jatropha, and geothermal) for illustration. Several key areas of public concern can already be recognized and the trends bear close observation for their impact on island systems and their biodiversity. The picture that is forming has potential for national and international application.

CONFERENCE SCHEDULE

Wednesday, June 29

8:30am – 5:00 pm Field Trip to Volcano National Park

All registered participants should wear hiking attire and bring rain gear. Water is recommended. We will stop for lunch in the area. Meet in the hotel lobby; vans depart at 8:30AM.

7pm – 9pm Informal Social Mixer, Bayview Grounds

Thursday, June 30

7:30am – 3pm Registration
Keauhou I

8am – 9:45am Session 1: Waste and Human Health
Keauhou III
Moderator: Michael Reiter
Discussant: Will Focht

Dheyaa Wajid Abood
Hospital Wastewater treatment Using Multi Media Biological Activated Carbon Reactor

T.K.Bandyopadhyay
Impact of E-Waste in Environment and Human Health

Anita Agrawal
Variation in Leachate Characteristics from MSW Dumps

8am – 9:45am Session 2: Grassroots Community Intervention in Environmental Management
Keauhou IV
Moderator: Eric Fitch
Discussant: Kevin Hickey

Charles R. Simpson
Folk Narratives in the Middle Ages: A Window on Environmental Insecurity in Peasant Western Europe

Arindam Basu
Conservationism in India: Need for more Democratic Green Jurisprudence

Momoko Ozawa and Brenda Bushell
Women's Leadership in Nepal

9:45am – 10:15am Break
Keauhou I

10:15am – 12:00pm Session 3: Industrial Pollution and the Land
Keauhou III
Moderator: Theodore Feitshans
Discussant: Anita Agrawal

El-Mukhtar A. Belgasem and Ramadan I. Damja
Assessment of Possible Impact of Industrial Activities and the Use of Agrochemicals on the Levels of Toxic Chemicals in the Natural Environment

Ravindra Brahme
Industrial Pollution and Its Impact on Health: A Study of Industrial Area of Chhattisgarh

10:15am – 12:00pm Session 4: Ecotourism
Keauhou IV
Moderator: Shane Epting
Discussant: Eric Fitch

John Cusick
Teaching Ecotourism in the Backyard of Waikiki, Hawai‘i

Jeffrey L. Roburg
More Tourists Equals More Money – Isn't This a Good Thing? Tourism and the Case of Colonia Carlos Pellegrini, Argentina

Ntoh Robert Tiku
Mount Cameroon National Park, Eco- tourism and Prospects for Sustainable Development in Rural Communities.

12:00pm – 1:15pm: Lunch (on your own)

1:15pm – 3pm Session 5. *Special Session:* Open Roundtable: Towards an Supradisciplinary Curriculum
Keauhou I

This session will be built around the most recent work of the Roundtable for Integrated Systems and Sustainability Education. The featured speaker will be Dr. Will Focht, Oklahoma State

University, “Teaching Supradisciplinarily: Complexity Enhancement versus Disciplinary Integration”. All are welcome to attend this presentation and roundtable.

3pm – 4:15pm Session 6: The Costs of Mining. Environmental and Human
Keauhou III
Moderator: Eric Houk
Discussant: Michael Reiter

Jaeyoung Choi, Min-Kyu Ji , Hyun-Shik Yun, Eung-Do, Gee, Woo-Ram Lee , Young-Tae Park , Jung-Seok Yang , Man-Jae Kwon , Byong-Hun Jeon
Control of Sulfide Mineral Oxidation by Surface Coating Agents: Batch and Field Study

Demetri Kantarelis and Christopher M. McDermott
Energy & Coal in the USA: Benefits vs. Costs

Christopher M. McDermott
Coal Country – Appalachia WV

3pm – 4:15pm Session 7: Dealing with the Ocean
Keauhou IV
Moderator: V. Aliyev
Discussant: Philippa Wells

Shane Epting
Thinking for an Ocean: The Imperatives of The Interagency Ocean Policy Task Force and the Problems with Oceanic Sustainability Ethics

Eric J. Fitch
Sea Level Rise and Oceania: Policy Responses and Adaptation in a Changing World

Brett Woelber, Lilian Alessa, Victoria Gofman, Andrew Kliskey, Maryann Smith
Role of Bering Sea Sub-Network (BSSN) to map subsistence use and explore climate change impacts and adaptations

4:15pm - 4:45pm Break

4:45pm – 6:15pm Keynote Speaker 1
Keauhou I

Developing Alternative Energy Approaches in Hawaii: Realizing the Paradigm Shift and Its Meaning for Pacific Island Systems

Dr. William W.M. Steiner
Dean, College of Agriculture, Forestry, and Natural Resource Management
University of Hawaii-Hilo

Friday, July 1

7:30am – 10am Registration
Keauhou I

8am – 9:45am Session 8: Managing Water for Human Need
Keauhou III
Moderator: Robert Tiku
Discussant: Charles Simpson

Dheyaa Wajid Abbood
Water Management Challenge in Baghdad

V. A. Aliyev, S. G. Nabiyeva, R. N. Mahmudov, M. Yu. Yusifov, A. A. Ahmedov, E. K. Gafarov
The Soviet Environmental Legacy: Mingechevir Earthfill Dam

Eric E. Houk
The Impact of Reducing Agricultural Water Supplies
in Northern California

8am – 9:45am Session 9: New Applications of Sustainability Philosophy
Keauhou IV
Moderator: John Cusick
Discussant: Will Focht

Paul Faulstitch
Diversity and Sustainability in Post-Industrial Society

Eric J. Fitch
Is “Environmental Sustainability” the new academic paradigm?

Kirsten and Bart Bartels
Integrating Service Learning and Interdisciplinarity as Best Practices and Pedagogy for the Teaching of Environmental Studies and Sustainability

9:45am – 10:15am Break
Keauhou I

10:15am – 12:00pm Session 10. *Special Panel*: Microbial Ecosystem Fermentation as a Revenue-Generating Solution to Solid Organic Waste Reduction: A Multidisciplinary Approach

Keauhou III

Theodore A. Feitshans
Federal Regulation of Industrial Biotechnology in the United States and State Responses

Helmut H. Hergeth, Kelly D. Zering, Edward A. Calt, Theodore A. Feitshans
Island Financial Resource Impacts from Industrial Biotechnology
for the Treatment of Organic Waste Streams

Herbert G. Tull, Vivek Fellner, Helmut H. Hergeth, Edward A. Calt
Technical Assessment of Industrial Biotechnology for Treatment of Organic Waste Streams

10:15am – 12:00pm Session 11: Cooperation in Decision Making for Management
Keauhou IV
Moderator: Brett Woelber
Discussant: Michael Reiter

Kim Heung-Hoi
An Application of Collaborative Decision-Making Model to the Radioactive Waste Siting Processes in Korea

Jude Ndzifon Kimengsi
Population Growth, Land Use Change and Forest Degradation in Ndian Division of Cameroon: Drivers and Policy Options

John Harris IV
Common but differentiated: Creating an individual response to environmental degradation

Itaru Sugano, Hom Bahadur Rijal, Akira Okada, Masayuki Goto, and Brenda Bushell
Investigation of the Comfort Temperature in Traditional Houses of Nepal

12 pm – 1:30pm: Conference Luncheon
Tropical Terrace
Presidents' Addresses: Outgoing (Eric J. Fitch) and Incoming (Kimberly D. S. Reiter)

1:45- 3 pm Session 12. *Special Session:* The University of Hawai'i at Manoa Sustainability Courtyard as a Center for Campus Engagement
Keauhou I
Moderator: J. Cusick, University of Hawaii, Manoa

The student presentation emphasizes interdisciplinary approaches to knowledge and highlights principles and practices of sustainability at the University of Hawai'i at Manoa. Student leaders will discuss current efforts at infusing sustainability into UHM research, instruction, and service-learning while building on the momentum generated by institution-wide consultations, particularly the UHM Charter of Sustainability: Stewardship Based on Island Values, the Hawaii 2050 Sustainability Task Force created by the State Legislature, and Sustainable UH. A group of 20 undergraduate students

participated in projects that contribute to the research, instruction and service mission of the Environmental Center and Environmental Studies degree program, and supported campus engagement focused on the UHM Sustainability Courtyard. Students worked collaboratively on identified projects, as well as individual research and service-learning projects developed with community sponsors and/or faculty partners.

3:15pm – 4:30 pm Session 13: Impacts of Population Growth on Resources
Keauhou III
Moderator: Kirstin Bartels
Discussant: Bart Bartels

Masashi Kobatake, Akira Okada, Hom Bahadur Rijal, Hiromi Kobori, Masayuki Goto, Brenda Bushell
Investigation into the Water Quality of the Rivers in Kathmandu Valley and Local People's Attitude toward the Rivers

Svetlana A. Burtseva
Prospects of development of the geostatistical environment

Kometa Sunday Shende
Wetland Exploitation along the Bafoussam – Bamenda Axis of the Western Highlands of Cameroon

3:15pm – 4:30 pm Session 14: Risk Assessment and Management
Keauhou IV
Moderator: Penny Seymoure
Discussant: Will Focht

Izumi Kubota and Kiyoshi Takahashi
Application of Risk Assessment and Management to Climate Change Issues

Michael A. Reiter, Jack H. Gentile, Mark H. Harwell, Hongqing Wang and Wenrui Huang
The Integrated Assessment and Ecosystem Management Protocol: An Example from Apalachicola Bay, Florida

Jose Rodriguez
Examining the Effectiveness of Institutional Arrangements in Managing the Lingayen Gulf, Philippines

Yoshinori Taniguchi and Ryosuke Iida
Conservation for Freshwater Fish in Japan from the Perspectives of River Management, Global Warming, and Exotic Species Invasions

5 pm – 6:15 pm Business Meeting
Keauhou I
All participants are welcome to attend.

Saturday, July 2

7:30am - 8am Gather
Keauhou I

8am – 9:45am Session 15: Wetlands and Stream Restoration
Keauhou III
Moderator: Linda Jane Irwin
Discussant: Michael Reiter

Benson M. Mwangi and Rosemary W. Kimani
Efficiency of constructed wetlands in treatment of flower farm waste water effluents around Lake Naivasha, Kenya

Young-Tae Park·Jung-Seok Yang·Hyun-Shik Yun·Min Kyu Ji·Eun Do Jee·Won-Hyun Ji, Hyun-Ho Kwon, and Jaeyoung Choi
Inhibition of growth and activity of iron oxidizing bacteria for the prevention of acid mine drainage production

Danielle Schwarzmann
Stream Restoration: Linking Environmental Benefits to Economic Benefits

9:45am – 10:15am Break
Keauhou I

10:15am – 12:00pm Session 16: Greening the Built Environment
Keauhou III
Moderator: Jude Ndzifon Kimengsi
Discussant: Charles Simpson

Philippa Wells
The Transition Initiative as a Grass-roots Environmental Movement:
History, Present Realities and Future Predictions

Stephen Boucher, Richard Esposito, Alberto Fiore and Jessica Lynch
Green Housing in the USA

Haileab Zegeye
The role of botanic gardens in biodiversity conservation and sustainable development

10:15am – 12:00pm Session 17: Planning for Disaster and Conflict
Keauhou IV
Moderator: Danielle Schwarzmann

Discussant: John Harris IV

Kometa Sunday Shende
Ensuring Human Safety in the Disaster Prone Coastal Town of Limbe, Cameroon

Regina P. Juno
From Coastal Resources Management to Adaptation: Mainstreaming Climate Change Adaptation into Local Development Plans

Jude Ndzifon Kimengsi
Developing Tri-Phase Model for Land Conflict Resolution in Some Conflict Ridden Parts of the North West Region of Cameroon

1 pm – 5pm Field Trip to Place of Refuge

All registered participants should wear hiking attire and bring rain gear. Bring snorkeling gear if you wish to snorkel after the tour. Meet in the hotel lobby.

ABSTRACTS

(*: indicated presenter)

Hospital Wastewater Treatment using Multi-Media Biological Activated Carbon Reactor

Dheyaa Wajid Abbood
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Most Babylon hospitals in Iraq are not connected to any municipal treatment plant, and have not their own sewage treatment plants but it are thrown into the rivers. Hospital wastewater poses a significant pollution threat to water-bodies and soil and hence the quality of the effluents must be controlled. Lab scale model of multi media biological activated carbon reactor of 1800mm length and 300mm diameter was designed and constructed as compact bioreactor with two supplementary tanks. The first tank was used for preaeration or preozonation before biofiltration while the other was used for ozonation as disinfection. Four different medias of 350mm height includes Sand, Porcelinaite, Granular activated carbon and Granite were selected as good separated medias of biofilter. Treatment system consists of integrated anaerobic-aerobic units are designed and processed to improve biofiltration processes by increasing the available biomass at constant retention time and improving hydraulic efficiency by maximizing the flow path. It was found that the chemical or toxic wastes generated by the Babylon's hospital were 9% from the wastewater. The objectives of hospital wastewater treatment is to

- produce effluent suitable for agricultural or aquacultural reuse (or both), or to produce an effluent that can be safely discharged into inland or coastal waters.
- summarize the long-term performance experience of integrated anaerobic-aerobic multi media biological activated carbon reactor system for hospital wastewater treatment.
- analyze the removal efficiency of pollutants and significant removal of pathogenic bacteria
- present both the primary results on the biological characterization of the hospital wastewater before their discharge in the municipal sewage system and their effects on the urban wastewater systems and the environment

Results showed that with proper design specifications of multimedia biological activated carbon systems MMBACS perform better than conventional treatment systems under similar conditions of wastewater water quality and environmental conditions. The tested locally available materials can be effectively used as basic treatment media with run greater than 148 d.

WaterManagement Challenge in Baghdad

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Both the 1991 Gulf War and the 2003 Iraq War have affected and used the water resources. Most of the water in Baghdad comes from Tigris river. Baghdadis need abundant water supplies to live and survive in the desert environment. The wars and economic sanctions have left the people in a state of drought, with the water largely contaminated and few resources available to clean it. Baghdad has arid climate with extremes of heat and cold. High temperatures of 51°C in the capital city of Baghdad, which lies in the central part of the country, have been recorded. Analyses were conducted from 2005 to 2010 and the results for percent of electricity consumption by end use shows that 10 percent is for evaporative cooling. In addition to water policies of

Turkey, Syria and Iran, which affect strongly the water availability in Iraq, the lack of water for irrigation is the major reason of failure of agricultural policy in Iraq . Water shortage in Baghdad occurs. More than one out of three Baghdadi's people lack access to safe drinking water, and more than one out of six lack adequate sanitation. Wide attention is required for starting national water conservation programs. In arid areas of Baghdad, water conservation and reuse are issues that receive a great deal of public attention in the last decade. The search for ways to responsibly use and reuse water is vital to the sustainability of the water supply and thus the future of these regions. Treated gray water in houses can be reused for toilet flushing, outdoor irrigation and spraying water evaporation cooling of selected apartments building located in Baghdad. Treated wastewater also can be used for irrigation and streets cleaning by municipal institutes. Several experiments in Baghdad have been achieved for small scale to reuse graywater for toilet flushing, irrigation, outside house cleaning and evaporative cooling. The basic goal of this project proposal is to apply the graywater for wide range as solution of water crises in Baghdad. Baghdad's Water demand is estimated to 3.2 Millions m3/day, the quantity of produced water is (66%) of the required needs. The Average daily use is about 18% lower than the annual daily average in Winter, while it is 38% higher than the annual daily average, that cause wide variation in water demand during the year.

- For selected communities the maximum daily use is about 205% of the average daily use.
- Although electrical energy have decreased significantly during the past decade, Increased use of evaporative cooling make residential water use was continued to rise approximately 5% per year.

Variation in Leachate Characteristics from MSW Dumps

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INDIA

Rama Pandey
Professor, Department of Chemistry, Pt. Ravishankar Shukla University, Raipur, Chhattisgarh
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Urbanization and rapid population growth have led to degradation of environment, by increased rate of exploitation of natural resources and generation of increased municipal solid wastes. Municipal solid waste disposal is a big problem for most of the towns in third world countries. In India dumping of municipal solid waste on low laying area is the common practice in most of the towns. The dumping of waste in uncontrolled manner creates many kinds of problems for the surrounding environment. The municipal solid waste dump when comes in contact with the rainwater, generate leachate. It is important to know the characteristics of this leachate for effective management of solid waste dumps as well as to evaluate the probable impacts of this leachate on the surrounding environment. The characteristics of leachate depend on several parameters like characteristics of municipal solid waste, amount of rain fall etc. In the present study an attempt has been made to investigate the variation in characteristics of leachate generated from municipal solid waste (MSW) dumps of Raipur city in India. Leachate samples were assessed for physical, chemical and biological characteritics.

The Soviet Environmental Legacy: Mingechevir Earthfill Dam

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A.A.Ahmedov[3], E.K.Gafarov[3]
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In the Soviet period, for hydropower, flood control, irrigation, etc. purposes, have been built the Mingechevir cascade of four dams on Kura river in Azerbaijan. Rivers of the Kura basin have extremely irregular discharge throughout a year. In spring, 2010, flooding in the Kura river became catastrophic, destroying river banks and flooding villages in many places. The Mingechevir earthfill dam is one of the highest dams in Europe that was constructed through sprinkling.

Like all hydraulic structures, dams hold a potential risk of breaking. The Kura river basin, with 8 dams, takes 14th place in the world for the quantity of large dams. Heavy flooding and/or failure of one of dams in Turkey or Georgia is enough for a catastrophic destruction cascade of the Mingechevir earthfill dam and all other downstream dams in Azerbaijan.

In the presented work the following risks have been considered:

- Kura river valley population
- Economy of Kura river's coastal zone
- Environment of Kura river's downstream coastal zone and Caspian Sea

The large scale water management efforts have been undertaken in Azerbaijan during the last 20 years of independence. However, the Soviet environmental legacy and military conflicts in the Kura river basin led to unfortunate results: today the Mingechevir dam and reservoir of the same name are both a blessing and a curse for Azerbaijan.

Mingechevir dam safety management, related to potential flash floods induced or amplified by manmade structures along Kura river valleys in Turkey, Georgia and Azerbaijan, is a problem that calls for the definition of policy guidelines and new technical instruments. A decision support system composed of an information system that will support flood modeling and prediction, dam-breach and dam-rupture models, as well as operational safety guidelines under normal, training, and emergency situations, may constitute an important instrument that will help decision makers to comply with legal regulations. This paper presents one of the components of this decision support system, namely the information system that includes elements of aero-space geodetic stars in the body of dam and a digital water level recorder system with GSM/GPRS transmitter for the reservoir.

Impact of E-Waste in Environment and Human Health

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E-waste means discarded, obsolete, or out of use electronic products. The electronic industry has been growing in rapid space due to the dynamic nature of technology in electronic and communication sector. The consumers and user are shifting from low capacity, fewer-feature products to high capacity, more-feature products. Hence a lot of e-waste has been generated in the form of discarded computer, laptop, mobile phones and other communication devices. The current global production e-waste is more than 20 million tones. E-waste contains both precious metals like copper and platinum as well as heavy and toxic metals like lead, cadmium etc. Also, quantities of polymers remain in e-waste. Due to the presence of precious metals, people recycle e-waste to extract them. People import e-waste from developed countries like the USA and Europe, which are the major

producers of e-waste today. Recycling, use, and dumping of e-waste causes severe environmental health hazards in the water, soil and air. Smoke generated due to burning of those e-wastes produces lead fumes, dioxin, furans, polycyclic aromatic hydrocarbons etc. The chemical composition of e-waste has been changing over the years as per the needs of industry, which causes problems in regulation of e-waste. The toxic fumes generated from e-waste effect human health even in very small concentration. Hence, there is a need to know the toxic and hazardous elements present and their effect on soil, water, and air as well as the food chain which ultimately influences the total ecosystem. This paper presents issues pertaining to changes in the composition of e-waste with evolution of new technologies and their effect on environmental and human health, and suggests a framework for e-waste management and regulation.

Integrating Service Learning and Interdisciplinarity as Best Practices and Pedagogy for the Teaching of Environmental Studies and Sustainability

Kirsten A. Bartels, Honors Faculty Fellow
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As sustainability continues to gain momentum in the private sector, colleges and universities look to incorporate its triple-bottom line not only into their best practices but into their classrooms. While the terms of multidisciplinary and interdisciplinary seem to affix themselves to discussions relating to environmental issues, the application of multiple perspectives into seamless and progressive learning outcomes may not turn out as originally intended. Drawing on experience as part of the Grand Valley State University interdisciplinary Environmental Studies program (which incorporates Humanities, Sciences, and Social Sciences and practical/real world applications to address the issues which traverse and transcend disciplinary boundaries) and work with GVSUs Sustainability Initiative, this presentation candidly discusses the strengths and weakness (the successes and failures) of exploring environmental and sustainability education from an interdisciplinary prospective and the incorporation of service learning opportunities as critical pedagogical tools to the success of integrated learning.

Conservationism in India: Need for more Democratic Green Jurisprudence

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Environmentalism in India, in spite of having rich lineage, is reflected in its environmental jurisprudence in a very repressive manner. The Agency-administered licensing system as a principle method to discipline polluters has created a regime no way less than authoritarian. The environmental standards that are set mostly based on the best available technology grossly disturb processes of balancing conservation and development, thereby causing intense resource distribution conflict. As a prominent social process, India's environmentalism reflects the history of struggle and conflict for life and livelihood, as opposed to the post-material element in Western environmental ethics. India's pining for economic development, opening and enlarging the consumer society like never before while coupled with uncontrolled population growth, opens up the dangerous possibility of upsetting its utilitarian policy-making philosophy. Further complicating the matter is the realization that victims of resource-distribution conflict are inadequately represented in environmental policy and law making processes (which can be seen in the Bhopal Tragedy, Narmoda Dam incident, and India's forest rights laws and policies, still showing a colonial hang-over). In this presentation I will posit that emphasizing anthropocentric

approaches along with democratic values can provide constructive insight into the environmental problems in India. Although, such discourse is conflict-ridden, the necessity is felt throughout the world. For India, ascertaining such philosophy heavily relies on how India allocates its resources fairly, thereby minimizing environmental conflicts in the near future. An analytical structure focusing on environmental rights awareness programs will be the key to the proper realization of the above environmental philosophy.

Assessment of Possible Impact of Industrial Activities and the Use of Agrochemicals on the Levels of Toxic Chemicals in the Natural Environment.

El-Mukhtar A. Belgasem and Ramadan I. Damja
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The boom in some chemical industries and the wide excessive uncontrolled long term use of enormous varieties of agrochemicals, especially in Libyan coastal areas, drove us to carry out an extensive study to assess the possible impact of those uncontrolled notorious human activities on the levels of some toxic chemicals in the natural environment. Therefore, an enormous number of environmental samples known to be especially subject to possible rain and airborne contamination were carefully analyzed for some of the most common chemical pollutants relevant to the industrial and agrochemical activities in the area around Tripoli city. Special emphasis was given to the analytical methodology such as sampling, sample preparation and evaluation of the analytical data such as reproducibility, recovery and linearity. The important role of chemical research and science policy to monitor the environmental samples is briefly discussed in this paper.

Green Housing in the USA

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This presentation/paper attempts to show that technologies are available today to construct, manage and maintain homes using renewable energy resources so that the amount of energy produced is equal to the amount of energy consumed. Additionally, we show that, although initial investment costs are high, conventional long-term cost/benefit analysis, subject to sustainability constraints, generates substantial net benefits. Since residential homes account for over 20% of the green house gas emissions in the U.S., green housing should be expected to significantly reduce carbon footprint.

Industrial Pollution and Its Impact on Health: A Study of Industrial Area of Chhattisgarh

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Environmental quality could be considered as a vital indicator in determining the quality of life. Along with the benefits of industrial development, industrial pollution is the major drawback of manufacturing sector. In this paper an attempt has been made to assess the impact of air pollution on health. The capital of Chhattisgarh, Raipur has been affected for many years by very serious pollution problems due to enormous industrial emission from dirty industries. Urla and Siltara, two heavily polluted industrial areas, are located about 10 km

from Raipur. The analysis reported in this paper is based on primary data and time series data collected from primary health centers.

Prospects of Development of the Geostatistical Environment

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Geostatistics of the environment is a part of the object of research – antropobiosphere. It studies the interaction of people and environment in the conditions of the geosystem. Prospects of its development are determined, firstly, by conformity to natural laws of air, forests, water, earth, bowels, flora and fauna. There are several sections touching all spheres of economy:

- Global stock-taking of variety of natural substances from the point of view of their quantitative characteristics
- Geostatistical analysis of dispersion of chemical elements in space as geostatistical aggregate states
- Climate – a global spatio-temporal complex demanding geostatistical generalization of substance and energy exchange
- Earthquake – a massive process of socially important reality having a structure corresponding to the territorial organization of people

In prospect, studying the problem of earthquakes is seen in terms of spatiotemporal analysis of massive processes of movement and change of our planet: chemical, physical (plus energetic), geometrical, biological, etc., including living substance as having intellect. Evolutional and deformational processes manifest in geospheres and are described by geostatistical categories. It is concentrated on people who feel these interactions and co-operation in a delicate way. Geostatistical research as a new direction of scientific research of the environment lets us make conclusions:

1) Territorial formation together with socio-natural variety is the basement for human research
2) Certain conditions of human life take part in reproduction and movement of massive processes of the Earth by localization of relations with nature
3) Prospect of analysis demands balance systems based on geostatistical stock-taking of substance, energy, powers and other changing parameters
4) Geostatistics of the environment – a prospective branch of global economy where modern leaders of mankind realize the economic complex of the planet in relationship with territorial organization of the development and knowledge about energy-informational direction of common space of the Earth

Control of Sulfide Mineral Oxidation by Surface Coating Agents: Batch and Field Study

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Potential of several surface coating agents for alleviation and control of sulfide mineral oxidation at two Acid Mine Drainage (AMD) sites (i.e., Young-Dong and Il-Gwang) was examined by conducting both batch experiments and field tests. Powdered pyrite as a standard sulfide mineral and rock samples from two mine goaf were mixed with several surface coating agents (i.e., KH_2PO_4, MgO, $KMnO_4$, apatite, dolomite, cement) and then incubated with oxidizing agents (i.e., H_2O_2 or NaClO) and buffer solution (i.e., NaOAc). Batch experiments with Young-Dong mine samples showed the least SO_4^{2-} production in the presence of $KMnO_4$ (16%) or cement (4%) material within 8 days. In the case of Il-Gwang mine samples, the least SO_4^{2-} production was observed in the presence of KH_2PO_4 (8%) or cement (2%) material within 8 days. Field-scale pilot tests also demonstrated that only 7% of SO_4^{2-} was produced in the presence of KH_2PO_4 suggesting the amendment of the surface coating agent can be a promising technology for inhibiting sulfide oxidation from AMD sites.

The University of Hawai‘i at Manoa Sustainability Courtyard as a Center for Campus Engagement

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The student presentation emphasizes interdisciplinary approaches to knowledge and highlights principles and practices of sustainability at the University of Hawai‘i at Manoa. Student leaders will discuss current efforts at infusing sustainability into UHM research, instruction, and service-learning while building on the momentum generated by institution-wide consultations, particularly the UHM Charter of Sustainability: Stewardship Based on Island Values, the Hawaii 2050 Sustainability Task Force created by the State Legislature, and Sustainable UH. A group of 20 undergraduate students participated in projects that contribute to the research, instruction and service mission of the Environmental Center and Environmental Studies degree program, and supported campus engagement focused on the UHM Sustainability Courtyard. Students worked collaboratively on identified projects, as well as individual research and service-learning projects developed with community sponsors and/or faculty partners.

Shades of Green in the Tourism Sector:
A Survey of Sustainability Practices and Awareness in the State of Hawai‘i

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This paper presents results from surveys that investigate the sustainability practices and levels of awareness in Hawai‘i’s tourism sector by examining three aspects of the tourist sector: hotels, tour operators, and visitors. The purpose is to gauge the levels of sustainability practices and awareness among hosts and guests in a location where tourism is the dominant economic sector and natural resources and cultural heritage are advertised to attract market share. If the tourism sector is more sustainable, the quality of life for residents will improve, ecosystem services will begin to be restored, and the resiliency to climate change impacts will increase. This study points to gaps in what is and can be done for Hawai‘i to be the leader in sustainability.

Thinking for an Ocean: The Imperatives of The Interagency Ocean Policy Task Force and the Problems with Oceanic Sustainability Ethics

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Several essays have been published urging humankind to extend ethical consideration to oceans. Much of this scholarship turns to Aldo Leopold's notions of "thinking like a mountain" and his "land ethic" for a structure that exhibits what an "ocean ethic" would look like. However, these approaches suffer from foundational dilemmas. While they intend to provide a blueprint for oceanic sustainability and "oceanic health," they are not consistent with the necessary vantage point, which would allow them to meaningfully combat anthropogenic problems. Barack Obama's "Interagency Ocean Policy Task Force," however, offers a better approach because it follows a logically coextensive pattern that favors utilitarian and duty-based methods of ethics. The benefits of this approach allow more sustainable ethics and practices to flourish. The following essay exhibits the strengths of the policy, and it also shows how political maneuvers can fail despite the best intentions. Yet, aside from the problematic conditions surrounding ocean policy, the following essay shows how one can amend political shortcomings with regards to ocean ethics.

Diversity and Sustainability in Post-Industrial Society

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Biological diversity and cultural diversity are linked, and as one diminishes, so too does the other. Awareness of the need to protect Earth's diminishing biological richness has focused greater attention on Indigenous peoples, since their homelands are increasingly understood as places worthy of protected status, and that their knowledge of these areas is unique and unparalleled. Studies in human ecology illustrate how many practices of land use and resource management are not only adapted to local ecosystems, but have shaped those ecosystems in ways that make them more diverse and stable. Ecologists increasingly recognize contributions of traditional management practices, not only in the maintenance of ecosystems, but also in their restoration. Australian Aboriginal use of fire in maintaining viable populations of rufus hare-wallaby, for instance, is an example of traditional resource management that has proved effective; the rufus hare-wallaby of central Australia became nearly extinct after cessation of traditional fire management techniques, but rebounded upon their revitalization. By deconstructing old ways of engaging in the practice of environmentalism, while simultaneously reconstructing new ways, we can begin to build a new vision of sustainability for an interconnected world. The ultimate question for human ecology is whether it is possible to create modern socionatural systems that are truly sustaining; that is, that avoid the features of contemporary systems in which the human factor dominates to the detriment of the environment. This question cannot be answered in the affirmative so long as the concepts of growth, technological neutrality, and unlimited gratification prevail. Social policies shaped by these concepts offer little hope for sustained-resource programs. Program developers and evaluators have conventionally viewed sustainability as divided into two independent and even competing, factions; biological and social. But sustainability has always been, and will continue to be concerned with the management of cultural activities: What ecologists do is never independent of cultural, political, or economic interests. Conservation biologists are increasingly appreciating Indigenous people's ecological knowledge and achievements, and are becoming more sensitive to human rights and sovereignty issues raised by conservation practices. Singular understandings of nature undermine the fundamental ecological concepts of diversity, complexity, and of interrelationship. In addition to sharing our own vision of nature, ecologists can seek to bring together diverse insights about global biomes.

Federal Regulation of Industrial Biotechnology in the United States and State Responses

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There is no federal schema in any comprehensive sense for the federal regulation of industrial biotechnology in the United States. The subset of industrial biotechnology that is defined as genetic engineering is the most heavily regulated area of industrial biotechnology. However, even in that area the level of regulation is low where the work does not involve a release to the environment, employment of a life-form with incorporated pesticidal properties, or a listed pathogen. Indeed genetically engineered organisms held for production of known chemicals, separated from the living organisms that produced them before sale, may in many instances be wholly free of federal regulation. Industrial biotechnology that involves neither genetic engineering nor regulated pathogens is generally wholly unregulated at the federal level. Given the absence of federal regulation scope exists for regulation by U.S. states and territories. This may be particularly critical for states and territories, that are island economies or that are otherwise vulnerable to non-native invasive species, and that are dependent upon international trade and tourism.

Is "Environmental Sustainability" the new Academic Paradigm?

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In academia, there have always been at least two parallel tracks dealing with natural resources. First, there are the traditional disciplinary approaches evolving from Natural Philosophy to Natural History to the Natural Sciences including Biology, Chemistry and Geology. Second, the applied fields of Conservation and Preservation through Environmental Science, Studies and Policy. Each broad set of fields have gone through phases of diversification and consolidation as curricula evolved to meet the needs of academe and society. Some consider "environmental sustainability" to be the next step in this evolution. The various meanings of this term, accompanying definitions and implications for both the disciplinary and applied inter and multi disciplinary fields are explored.

Sea Level Rise and Oceania: Policy Responses and Adaptation in a Changing World

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Globally, sea level is rising. Consensus holds that there's linkage to climate change. Whether demonstrated or not, sea level rise has been independently verified as occurring and accelerating. The coastal zones of most countries are areas of critical habitat, high primary productivity, and fragile geographies constantly in struggle against the sea. Coasts are also prime human habitat and locations for most global metropolitan centers, and highest population concentrations. In coastal countries which have a significant hinterlands, planning

discussions generally revolve around what can be done to physically prevent loss of lands to the sea and/or where to retreat above the "rising tide". But, w hat if there wasn't higher ground? Many nations' topography are such that a rise of one meter results in the loss of most habitable land, and/or which makes what remains extremely susceptible to storm events. Vietnam and Bangladesh are being confronted with the loss of much of their habitable lands in less than 50 years if the rate of sea level rise follows the current consensus projections, and more recent data seems to indicate that sea level rise is accelerating. Kiribati and the Maldives have already lost islands to the sea. Nauru has to mine out its phosphate resources to fund an exodus. Niue, though unaffected by sea level rise, has lost most of its population do to related economic and environmental impacts. Even Australia will feel the effects; 95% of Australia's population lives within 60 km. of their coasts. Their interior is becoming progressively drier with climate change. Squeezed by this wet/dry dynamic, they watch another wave arise. In Oceania and around the Pacific Rim, questions are asked regarding a new Oceanic diaspora. Ecogees (environmental refugees) are already a recognized demographic phenomenon. Where will ecogees from these regions migrate once the sea overcomes their livelihoods? What can nations and international organizations do to help? With "refugia" like the U.S.A. and Australia tightening immigration policies are there solutions?

Teaching Supradisciplinarily: Complexity Enhancement versus Disciplinary Integration

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Various pedagogical designs and core competency prescriptions for higher education environmental program curricula have been offered. It appears that general agreement among environmental faculty exists on field identity, which places the cross-disciplinary study of the human-nature interface as its focus. However, the challenges in offering such a curriculum remain insufficiently addressed.

This presentation argues that a post-disciplinary approach that relies on increasing complexity is superior to multi- and transdisciplinary approaches that rely on disciplinary layering and synthesis. Multidisciplinary curricula that include courses from various disciplines leave it to the student to integrate disparate paradigms, conceptual frameworks, theories and methods to achieve some form of coherence, perhaps through "pointillism" – the impression of blending when viewed from a distance. Transdisciplinary (including interdisciplinary and pluridisciplinary) curricula attempt to facilitate disciplinary integration through reference to disciplinary relationships (juxtaposition and intersection). The success of these approaches depends on the abilities and dedication of instructors, who are often rather narrowly trained themselves, to identify and explain these relationships.

A superior approach embraces consilience (unity of knowledge) as the teaching model. In such a supradisciplinary (or hyperdisciplinary) curriculum, disciplinary boundaries are ignored or at least minimized. In their place, the curriculum emphasizes unity from the beginning and then increases complexity as the student progresses and matures. To use a metaphor, a complexity-building curriculum is analogous to building a color portrait starting with a line drawing, then shading, and finally color layering (e.g., cyan, magenta, and yellow). In each of these five steps, the holistic image is presented so that the viewer always understands the entire picture; disciplinary integration and synthesis are not required.

This presentation offers suggestions for how an environmental curriculum can be designed that relies on complexity enhancement instead of disciplinary integration. The author recognizes that it is best if supradisciplinary instructors offer these courses. Fortunately, many environmental programs in higher education endeavor to graduate such students. If environmental programs have autonomy sufficient to hire supradisciplinary faculty, then complexity-enhancing courses can be offered successfully.

Interdisciplinary thinking and academic sustainability

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For the past 125 years the university has been the home of knowledge production. The 20th century research university combined a Kantian belief in disciplinarity, a Humboldtian commitment to linking research and education and upholding academic autonomy, and a Cartesian allegiance to infinite knowledge production. This approach to knowledge creation was seen as sufficient, for knowledge products themselves were understood as automatically relevant to society, and no one imagined a problem with endless knowledge production. The 20th century model of knowledge production is now under pressure from a number of sources: information technologies, neoliberal assumptions and demands for greater accountability. 'Interdisciplinarity' has become the term of art for addressing this crisis. But interdisciplinarity is no panacea to the challenges facing knowledge production today. In addition to knowledge on sustainability, knowledge production itself must now be made sustainable. This requires clearly connecting knowledge production and use, and ending the bad infinity of knowledge production.

Common but Differentiated: Creating an Individual Response to Environmental Degradation

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Currently the United States is without a comprehensive climate bill that would curb emissions and provide for a sustainable environmental future. However, change is not created through the government acting alone, without the consultation of business and the community. Change must be created through individual citizens acting in response to a common but differentiated need to solve the pending environmental crisis.

Island Financial Resource Impacts from Industrial Biotechnology for the Treatment of Organic Waste Streams

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Microbial Ecosystem Fermentations (MEF) can bring business, financial and environmental benefits to island economies by generating multiple revenue streams from organic waste that now requires expensive disposal. MEF systems do not require sterile feedstocks and are capable of multiple concurrent products, offering a ten-fold increase in revenue compared to stand-alone biogas using the same feedstock and reducing disposal volumes by 90%. MEF consumes many organic waste materials, including the feed grade (FG) fruit and vegetable waste, or municipal solid wastes (MSW) and sewage sludge (SS). Different feedstocks make different products; increasing local economic diversity. Carbohydrates and cellulose in FG materials are converted to High Protein Animal Feed (HPAF), displacing soybean meal imports. MSW and SS can produce enzymes, proteins and amino acids for use in other industrial processes, providing export revenue. All of the MEF systems can produce enough byproduct bio-methane to self-power their process, reducing fuel imports. A Distributed Manufacturing Architecture for multiple MEF systems in a localized region connects each unit to a central control room for constant monitoring and connection to additional expert support in remote locations. This real-time connection to off-island technical expertise will supplement the local labor pool, allowing higher level technologies to be applied by indigenous people, who are trained by this remote collaboration. Distributed manufacturing allows continuous monitoring of many systems by one central facility, allowing a three-fold labor utilization improvement when 25 or more systems are in the group, compared to stand alone staffing levels.

An Application of Collaborative Decision-Making Model to the Radioactive Waste Siting Processes in Korea

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This study tried to examine the siting processes of low- and medium-level nuclear waste storage facility, with the city of Gyeongju chosen as the site after 19 years of frustrated failures after failures by authoritarian decision-making processes dominated by the central Korean government. An integrated theoretical model of policy network and inter-organizational relationships which includes a series of linear factors such as contextual factors, mediating factors (governance structure, collaborative leadership, trusting culture), and outcome variable of benefits of collaboration was used for assessing the decision-making processes of the facility. A considerable amount of evidence was found to validate the causal relationships in the model. Though the model used in this study demonstrated a certain limitation of cultural transitivity to explain the decide-and-defend style of authoritarian making processes in Korea, the mechanism of how a NIMBY project was turned into a PIMBY project was revealed in this study. Finally, implications of this study were discussed.

The Impact of Reducing Agricultural Water Supplies in Northern California

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In California, a majority of the fresh water supplies are located in the northern part of the state while a majority of the water consumption is in the southern part. As such, large federal and state projects have been developed in order to facilitate the transfer of northern California water supplies to water users in the south. Historically, these transfers have placed pressure on northern California farmers to help meet the needs of urban development in southern California. However, recent environmental concerns resulting from threatened species in the Sacramento-San Joaquin River Delta (i.e. Delta Smelt) and threatened and endangered Chinook salmon runs in the Sacramento and San Joaquin rivers is placing even more pressure on northern California water supplies. As long as the benefits of these water transfers exceed the costs, economic theory supports the reallocation of water from agriculture for environmental preservation. However, it is common for these transfers to occur without fully understanding the economic consequences of these decisions. This is especially true for the off-farm impacts (indirect and induced effects) that these water transfers might have on the regional economy. As such, the focus of this paper is to examine how water is being reallocated in California and to estimate the economic impacts (direct and indirect) of reducing agricultural water supplies in Northern California.

From Coastal Resources Management to Adaptation: Mainstreaming Climate Change Adaptation into Local Development Plans

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As an archipelago and a developing country, the Philippines is very vulnerable to climate change. Republic Act 9729 (The Climate Change Act) was passed in October 2009 to address this concern with Climate Change Adaptation and Disaster Risk Reduction (DRR) mainstreaming into the national, sectoral and local development plans, programs and policies as its core strategy. This paper reviews current development initiatives of small island municipalities of Mindanao, Philippines on climate change adaptation into development. It also intends to share insights learned from working with local government units in the mainstreaming of climate change adaptation into coastal resources management. All coastal resources management plans reviewed revealed very limited reference to climate change and none on climate change adaptation. Disaster risk reduction and disaster management, however, were heavily referred to in most CRM plans. Two of the main reasons why local chief executives are hesitant to go into climate change adaptation are (1) the pervasive lack of understanding on the impacts of climate change and (2) the lack of capacity on mainstreaming as an integrated planning strategy. The three insights learned from mainstreaming climate change adaptation into local development plans are: Integrated development planning is the way to go. Partner or perish; CCA is a process, not another project; and Inaction is more expensive than being pro-active NOW.

Energy & Coal in the USA: Benefits vs. Costs

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The purpose of this presentation is to describe some economic benefits and costs associated with coal in the USA as they are estimated by, primarily, three groups of constituents. Firstly, those who are concerned about human heath, led by scientists in top universities: they claim that there are many hidden costs which far

outweigh the economic benefits of coal burning. Secondly, those who are concerned about fundamental industries in the USA, led by electricity industry representatives: since more than 50% of electricity is produced through coal burning, and electricity is heavily used in all aspects of life especially in manufacturing, public transportation and electronic exchange of data, they claim that, despite the many health and footprint reduction benefits from "killing" coal burning, the economic costs would be astronomical in magnitude with the potential to drive the American economy (and perhaps the Global economy) into a prolonged depression. Thirdly, those optimists, led by technology scientists: they claim that new technologies have been emerging capable of reducing sulfur dioxide and nitrogen oxides; therefore the abundant coal reserves, accompanied by clean burning, can continue offering energy-type benefits (inclusive of energy independence) to our vast economy for many generations to come deep into the future.

An empirical analysis on the characteristics of environmental conflicts in South Korea

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The present study investigated the characteristics of environmental conflicts in South Korea by an empirical analysis. By using the database established by the DCDR (Dankook Center for Dispute Resolution), this study analyzed 89 individual cases of environmental conflicts which have occurred from 1990 to 2009. First, the results showed that many environmental conflicts are government-involved rather than resident-only-involved conflicts. Second, the results demonstrated that many environmental conflicts are value-laden rather than interest-laden. Third, the results showed that environmental conflicts are terminated most frequently by administrative order of government. Fourth, this study examined how these characteristics of environmental conflicts (e.g., type, way of termination) are associated with the intensity of environmental conflicts (i.e., duration, number of participants). Lastly, implications and limitations of these findings were discussed.

Developing Tri-Phase Model for Land Conflict Resolution in Some Conflict Ridden Parts of the North West Region of Cameroon

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The North West Region is witnessing demographic pressure and has predominantly hilly terrains which are often perceived as barren landscapes. This therefore pushes the people to the few available relatively gentle landscapes which are “promising”. This pressure and increasing land scarcity has, in most cases, initiated land disputes (family, tribal or farmer-grazier disputes). Indications of these disputes are the persistent intertribal wars which have rocked the landscape of the region over the years and have worked against her much needed peace, stability and development. This study makes use of empirical literature, field observations, focused group discussions with affected persons and the stratified random but biased distribution of 50 questionnaires to areas frequently affected by this chaos so as to identify the nature and causative factors of land disputes in this region and to evaluate the impact it has on the underprivileged groups. Furthermore, it examines the role of stakeholders of the North West Region in addressing these land disputes. The findings indicate that the overall effect of these conflicts is further land scarcity and consequent degradation which has been precipitated by the fact that the predominantly highland areas are perceived as “barren landscapes”. These findings gave room for a

tri-phase model to be derived showing (1) the nature of land disputes, (2) the impact of these disputes on the underprivileged groups in the North West Region of Cameroon and (3) conflict resolution options.

Population Growth, Land Use Change and Forest Degradation in Ndian Division of Cameroon: Drivers and Policy Options

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Ndian Division is replete with forest potentials which are gradually but consistently giving way to other land uses. Population growth has precipitated the development of other land uses which continue to gobble up the natural forests. The development of extensive plantations by Pamol and other numerous small holder oil palm plantations have acted as a "population trap" to this division. This activity has been the main driver of population growth which has been on the increase and threatens the once protected forest reserves. The local population which has little economic options heavily relies on the forest for timber and non-timber forest products to survive. This has created a forest degradation and poverty cycle with seemingly bleak prospects of escaping the cycle. The effect has been the upsurge of incompatible land uses. This study employs a combination of primary and secondary sources of data to analyze the trend of land use change and forest degradation, examine the drivers and evaluates the contribution of the phenomenon of poverty to forest degradation. It also suggests ways of halting the trend of forest degradation by adopting alternative and more sustainable land use practices which will also ensure the conservation of the natural forest.

Application of Risk Assessment and Management to Climate Change Issues

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This study focused on how we could apply risk assessment and risk management frameworks to climate change issues. In the existing literature, we looked at what benefits could be expected from such an application. The benefits were as follows: (i) we could address uncertain phenomena in the quantitative manner and demonstrate the explicit depiction of the size of the uncertainty; (ii) we could compare the results of climate change risk assessments with those of assessments of other risks, and devise an adaptation policy in the perspective of mainstreaming of adaptation to sustainable development; (iii) we could consider mitigation and adaptation strategies comprehensively; and (iv) we could examine differences in response characteristics, including individual and regional differences, differences among the recipients of impacts, and occasions to actively understand them. Our investigation of adaptations aimed at reducing climate change risk indicated that this adaptation is an urgent task in terms of responding to impacts within Japan, supporting developing countries, and formulating its position for international negotiation. Research needs to be expanded urgently, both to

investigate climate change policy in Japan and to take the initiative in discussions within an international framework.

Investigation into the Water Quality of the Rivers in Kathmandu Valley and Local People's Attitude Toward the Rivers

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The purpose of this research is to clarify the environment problems in Kathmandu valley, where the increase in population is impacting the environment in many ways. Water pollution of main rivers is one of most serious issues in the Kathmandu valley. Many people are depending on the rivers for their daily lives and the improvement of water quality is very important for the health of local people. The main causes of the river water pollution are garbage and sewage, and the reason may be due to the expanding population in the Kathmandu valley. However, the rivers are refreshed by rain water during the monsoon season and it makes the issue invisible. That is, this problem can be solved easily compared to other environment issues. But this problem should be regarded as a more serious issue by the people in Nepal because the water quality and surrounding riverside environments are becoming degraded in Nepal, as in other developing countries. This is the reason for the focus on the problem of rivers.

We conducted the water quality survey at 4 spots along the rivers in Kathmandu valley. Water quality was measured by conducting various pack tests such as NO_2, NO_3, COD, PO_4 and NH_4. To clarify the feeling and opinion of the local people about the river pollution, a survey was conducted to local people.

The results show that the water pollution is significantly higher than the acceptable standard. We also found that most residents living along the riverside are dissatisfied with the river pollution.

Efficiency of constructed wetlands in treatment of flower farm waste water effluents around Lake Naivasha, Kenya

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Lake Naivasha is one of the key Ramsar sites in Kenya, but whose faunal and floral diversity is threatened by pollution from flower farm waste water effluents occurring all round the lake. To ameliorate the problem, some flower farms have adopted constructed wetland technologies to treat their waste water effluents prior to release in to the lake. The efficiency of these wetlands in flower farm waste effluent pollution control has however not been assessed, although moves are already in place to upscale the technology. This study therefore aimed at examining the water quality changes as the flower farm waste effluent flows through the constructed wetland system. The Kingfisher Homegrown flower farm constructed wetland was selected for the study, as it is one of the largest and oldest. The study was conducted between October 2009 and March 2010. Measurements of

water quality parameters were carried out at 9 sampling stations along the constructed wetland system from inlet to outlet. Further, benthic invertebrates were sampled at the outlet in the V-channel to assess the suitability in supporting life forms. The results showed that water quality significantly improved from inlet to the outlet, with conductivity declining from 722 μScm^{-1} to 514 μScm^{-1} while TDS declined from 569 to 186 mgl^{-1}. Other water quality parameters such as total suspended solids (TSS), BOD, COD, total nitrogen and total phosphorous similarly declined significantly ($P< 0.05$) from inlet to outlet. Heavy metals generally occurred in low concentrations at the inlet, but still showed significant decline. The V-channel was inhabited by a dense community of macroinvertebrates dominated by chironomid larvae and oligochaetes. The results show that constructed wetlands are highly efficient in waste water effluent control and can be used in amelioration of point sources of pollution in to inland water bodies.

Women's Leadership in Nepal

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In order for women to take ownership of their lives both privately and professionally leadership is important. Leadership can be defined as the capacity to interact with others at home, at work and in the community or larger society, with the aim to influence others towards positive social change. Women's leadership ultimately contributes to creating a balanced and equal society.

In Nepal, women have been marginalized in terms of leadership roles both in the home and in society due to cultural, traditional and social limitations. However, with the country's democratization comes a growing awareness of the contributions women can make as leaders, and women themselves are recognizing leadership opportunities towards contributing to civil society. While various leadership training programs are being carried out, women's voices have not been heard with regards to their view on leadership and how leadership can best be developed and sustained in Nepal.

Therefore, the aim of this paper is to identify Nepali women's concept of leadership, and the kinds of personal capacity building, educational training and support systems they believe are important in managing their daily survival, their household and their enterprise. Findings from a survey piloted on thirty-six women of differing social backgrounds and age groups will be discussed and suggestions will be offered on how to shape leadership programs, based on the voices of these women.

Inhibition of Growth and Activity of Iron Oxidizing Bacteria for the Prevention of Acid Mine Drainage Production

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Acid mine drainage (AMD) is one of the most severe environmental problem that results from the oxidation of pyrite (FeS_2) and various other metal sulfides. In this study, the influence of microorganisms was tested on the process where AMD was released and a method used to inhibit AMD generated by microorganisms at

abandoned mine areas. *Acidithiobacillus ferrooxidans* and *Acidithiobacillus thiooxidans*, common microorganisms affecting AMD occurrence, were measured for activity and growth rate. Chlorine dioxide (ClO_2), NaCl, or surfactant (ASOR-770) was used as an inhibitor for working on activity and growth of microorganisms. Among three inhibitors, 10ppm of chlorine dioxide was the most effective inhibitor for AMD control due to reduce the activity and growth of microorganisms by 20%.

The Integrated Assessment and Ecosystem Management Protocol: An Example from Apalachicola Bay, Florida

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Growing interest in integrated assessment as a means of identifying environmental risks and developing management strategies to address local- to regional-scale environmental issues has highlighted the need for a systematic framework that combines scientific data, social and economic inputs, and management constraints to make fully integrated environmental decisions. We have utilized Conceptual Ecosystem Models (CEMs; also known as two component, or 2C, models) and Combined Ecological-Societal Systems Models (CESSMs; also known as four-component, or 4C, models) as the initial stage of an Integrated Assessment and Ecosystem Management Protocol (IAEMP). This protocol allows environmental managers to extend a graphical picture of scientific risk hypotheses for the ecosystems of concern to a series of forecast scenarios that can be analyzed in relation to management goals. Those particular scenarios having predicted outcomes that meet management goals are then evaluated in the context of social, political, and economic management constraints in order to select the "optimal" option for developing a management action. The selected management action is implemented as part of an adaptive management process, allowing the manager to evaluate the efficacy of the management action and, if necessary, refine the action, the risk hypotheses, or both as necessary to improve the outcome of future actions and scenarios. In this way, the IAEMP guides the process of characterizing the potential causes of environmental problems, identifying and selecting appropriate response options, implementing and evaluating the selected management options with respect to desired outcomes, and thereby either addressing the issues of concern or improving the conceptual ecosystem model to enhance future

decisions concerning that ecosystem. The protocol will be discussed with reference to a demonstration project involving the impact of proposed changes to the operating plan for Woodruff Dam in Georgia, and the impact of the resulting salinity and river flow on oysters in Apalachicola Bay, Florida.

More Tourists Equals More Money – Isn't This a Good Thing?
Tourism and the Case of Colonia Carlos Pellegrini, Argentina

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While environmentalists and conservationists claim "rights" for the environment and future generations by arguing in favor of regulating, or preventing the usage altogether of, a particular location with its spectacular flora and fauna, inhabitants of these areas often argue for the right to develop the area free of outside restraint. These "locals" claim that they have certain rights guaranteed to them by the state they are in and by international law. This conflict between environmental and individual rights comes to the forefront when we examine the effects of tourism, and related economic and social development, on the small town of Colonia Carlos Pellegrini, Argentina. Argentina has emphasized tourism as a way to help its economy recover from its 2001 economic collapse. It has clearly had a positive effect for the economy and the people of Argentina. By way of example, 4,312,669 tourists visited Argentina and infused over $3.8 billion U.S. into Argentina's economy in 2009. With the exception of the Global Economic Crisis, this influx of tourist dollars has remained relatively constant over the past 6 years. However, this increase in tourism in Argentina is also having an effect on the country's environment, its cities and its people.

This study will discuss how the competing need for increased income from tourism compare with the need for a clean and healthy environment, now and in the future. Specifically, this study will examine whether the positive effects of tourism outweigh the negative consequences of tourism by exploring the impact of tourists on the town of Colonia Carlos Pellegrini and the nearby environmental wetlands of Esteros del Iberá in Argentina.

Examining the Effectiveness of Institutional Arrangements in Managing the Lingayen Gulf, Philippines

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The Philippines is renowned for its valuable coastal and marine assets. However, these resources are under considerable threat and are confronted with severe degradation which includes overfishing, illegal fishing, illegal cutting of mangroves, coastal pollution, and coral and sand extraction. This raises concern among Filipino people, particularly the coastal communities who are highly reliant on the coast for food and livelihood. Based on a report by the World Resources Institute, 27 percent of the Philippine reefs is in poor condition (Burke et al. 2002). The decline in the reef health is so bad that the country has been included as one of the top priority marine 'biodiversity hotspots' in the world (Mone 2002; Roberts et al. 2002). These hotspots are places of the world's biologically richest ecosystem that are confronted with serious environmental degradation (Meyers et al. 2000). Furthermore, over 80 percent of original mangrove forest has been cleared, 20-30 percent of seagrass beds have been damaged, and the fishery resource has been rapidly declining (Licuanan and Gomez 2000; FAO 2002; Green et al. 2003; Eco-Gov 2004; BFAR 2007). Most of the damage is concentrated on the northern side of the country where Lingayen Gulf is situated (Eco-Gov 2004).

The Philippines needs to review its management efforts and policy implementation to address coastal degradation. The Lingayen Gulf ecosystem is a key example that can illustrate the problems faced around the archipelago and will be used as a case study in this research project.

Stream Restoration: Linking Environmental Benefits to Economic Benefits

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This research identifies the links between environmental benefits of stream restoration and its economic benefits. Although the literature on the environmental effects of stream restoration is growing, there are a limited number of research studies that have sought to value the benefits of stream restoration despite the millions of dollars being spent on restoration. Knowing how people value the environmental benefits of restoration can inform watershed management decisions and policy outcomes. Urbanization and population growth threatens the productivity and efficiency of the services nature provides. The loss of ecosystem services decreases their economic value in both marketed services such as commercial fisheries, and non-marketed services such as aesthetic and recreational values. Because the non-marketed services of stream restoration do not have a monetary value they have been taken for granted in land use and policy. Although there are markets for the products and services of many ecosystems such as clean water for drinking and aquatic species for human food consumption, many of the inputs (clean water and aquatic species) provided by ecosystems are not valued because markets do not exist for them. Therefore, a price cannot be determined for these goods unless alternative methods of valuation (hedonic pricing or state preference methods) are used.

Valuing environmental services is important for many reasons. Valuing services provided by ecosystems may provide justification for government intervention, help decide between two alternatives that seek to obtain the same goals, and help policymakers make educated decisions about the trade-offs between the uses of the environment, land and economic development. The research presented will explain the importance and provide a framework for linking environmental benefits to economic values of stream restoration and present what literature does this and where opportunities exist to expand this research.

Ensuring Human Safety in the Disaster Prone Coastal Town of Limbe, Cameroon

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Limbe in Fako Division of the South West region of Cameroon is located in an active and dynamic coastal zone characterized by geological, geophysical, geomorphologic and climatic hazards. This paper examines the nature and occurrence of hazards in this region as a view of prospecting possibilities for ensuring human safety within this dynamic environment. The frequency of volcanic eruption, seismic activities, landslides, flooding and coastal erosion has had adverse consequences on human lives, property and the environment in the city. In this regard, human occupation of high risk zones (hill slopes, floodplains, and coastal lowlands) is the source of problems of habitation in this region. Based on the concept of urbanization, vulnerability and exposure to risk, and using the DRI, drainage, relief, topographic maps, risk zones were identified. This paper recommends the

evacuation of people from some of these risk zones and in relocating elsewhere. These hazard prone areas do not only require careful policy planning but also require a rigorous implementation of the strategic master plan of the city.

Wetland Exploitation along the Bafoussam – Bamenda Axis of the Western Highlands of Cameroon

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The paper shows how wetlands have been exploited for economic reasons and some environmental consequences. This rapid colonization of these wet areas is due to the ever rising density in population and the continuous cultivation throughout the year. Since water is essential for plant and animal life, it is important to figure out the possibilities of regulating stream flow and wetland utilization since the water table in these wetlands and the surrounding areas within this region fall drastically in the dry season. For the short term economic benefits, the exploitation of these area is good but the environmental and hydrological implications in the long run are likely be disastrous. Alternative land use for this area has to be adopted if we have to maintain these wetland ecosystems with their ecological importance. The poor application of chemical fertilizers should be checked as they go to pollute some of the water bodies in this area.

Folk Narratives in the Middle Ages: A Window on Environmental Insecurity in Peasant Western Europe

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By the 13th century, the social and technological foundation for crop production in Western Europe, north of the Alps, rested on the accumulated knowledge and community arrangements of the peasant village. While sustainability had been achieved, it was fragile. The enveloping context of feudal land control, secular and ecclesiastical, weighed heavily on peasant prerogatives and economic returns. Cash trade at town markets and rising urban commercial classes exacted additional burdens on farmers. If we understand culture as the adaptation of a society to its environment, it is not surprising that the folk culture of the peasantry gave expression to these stresses. This paper examines two motifs in widely distributed folk narratives, the Melusina story complex found on the continent and in Britain, and the Robin Hood motif found in the British Isles. Both prioritize the forest as a setting for the renewal of life. The first expresses an awareness of the threats to subsistence and fecundity from the Church as it sought to suppress pre-Christian affiliations with nature. In this instance, the forest is a liminal region where supernatural forces can be encountered and life renewed. In the second narrative series, the forest represents a region of marginal political control by the feudal system, a region where subsistence can be directly obtained, where resistance can still be mounted, and where personal autonomy can be celebrated.

Naturalness and Biodiversity in Protected Areas

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There is an important controversy concerning how national parks, wilderness, and other protected areas are to be managed in the United States. Federal environmental legislation and policy requires that managers seek to maintain natural conditions or "naturalness" within protected areas. A number of leading experts in protected area management have argued, however, that naturalness should be abandoned as a primary goal in protected area management. In the recently published book, Beyond Naturalness, David Cole and other experts claim that given the widespread, even global impacts of human activities, including acid rain, the spread of exotic species, and climate change, natural conditions are in fact no longer attainable in these areas. According to these experts, managers must regularly intervene in protected areas to conserve "what we value," including native biodiversity, without the limitation of natural conditions. In this paper I wish to defend naturalness as a primary goal in our management of protected areas. My argument will be that naturalness offers this distinct advantage: it helps ensure the preservation of native biodiversity, including species such as amphibians that are extremely sensitive to human manipulations of their environment. I will describe an interesting case study in which managers have intervened in a wilderness area to conserve "what we value," without respect for natural conditions, and native amphibians have suffered as a result. Naturalness should remain a primary goal in the management of protected areas for very good ecological reasons.

Investigation of the Comfort Temperature in Traditional Houses of Nepal

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In this research, we investigate the thermal environment and subjective thermal comfort survey targeted at residents living in traditional houses in the Chitwan district of Nepal, with the aim to clarify the temperature which is most comfortable for residents. We also consider regional and seasonal differences by comparison with previous studies. If we can understand comfort temperature and the thermal comfort of the local people living in Chitwan by the present research, the impact of energy consumption can be altered through improved housing construction. The main objective of this research is to clarify the comfort temperature in indoor and semi-open spaces.

We measured the air temperature, relative humidity and illuminance around the residents, and asked them how they feel/prefer at that time. It took about 1-minute per person to complete the questionnaire. We surveyed each family member. This research approach can be conducted to the same person many times to increase the sample size, if the time interval is more than one hour. The field surveys were carried out on 6 and 8 March 2011, gathering a total of 514 responses from 511 residents. The comfort temperature was estimated using the regression method and Griffiths' method.

The results showed that residents are highly satisfied with the thermal condition of their houses, since they adjust well to the thermal conditions. The findings reveal that people in this study adapt well to the local climate, as a result of which comfort temperature is higher than the conventional standard.

Mount Cameroon National Park, Eco- tourism and Prospects for Sustainable Development in Rural Communities.

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The multiple benefits of National Parks and Eco-tourism in Rural Communities are widely accepted. This paper examines Mount Cameroon National Park, Eco – tourism and prospects for sustainable development in rural communities. A survey carried out made use of both qualitative and quantitative techniques of data collection. Data analysis was done using data obtained from both primary and secondary sources. Primary sources comprised mainly field studies and the administration of questionnaires. Questionnaires were used to obtain information from administrators and households regarding economic activities around the Mount Cameroon National Parks. Information on household heads with regards to their demographic structure and economic status entailed a random approach. Questionnaires were administered to traditional rulers for projects earmarked and strategies adopted for alleviation of the environment dynamics and the economy, forestation, pipe – borne water, building and construction for the community. A total of 300 questionnaires were administered. The statistical significant F – value for buildings indicates that irrespective of locations, there exists a significant difference in the number of buildings with respect to materials used. The study recommended strategies including providing enough social infrastructures by government to take care of the population.

Technical Assessment of Industrial Biotechnology for Treatment of Organic Waste Streams

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Island economies have more acute environmental problems associated with organic wastes from food processing plants and municipalities. Such waste must generally be disposed of in scarce local landfill space or shipped to other shores at great cost. The industrial biotechnology of Microbial Ecosystem Fermentations (MEF) can address these island problems by converting this cost center into multiple revenue streams. These anaerobic digestion systems are based on the microbes found in the rumen of cattle, producing renewable

industrial chemicals and other products. The MEF process is more complex than a simple biogas generator, but can produce 10 times the revenue. The complexity of MEF systems arises from an ecosystem approach employing dozens to thousands of species of microorganisms that provides greater flexibility to handle heterogeneous waste streams than traditional fermentation systems and higher levels of specificity of product output than anaerobic digestion systems. The products that can be made from these renewable chemicals include inks, dyes, paint, synthetic fibers, and bioplastics. When feed grade materials are used, the process can produce a high protein animal feed. Water from the waste can be reclaimed. Island geographies are vulnerable to typhoons, tsunami, and other severe weather, so MEF conversion systems need to be rugged, non-toxic when flooded and easily repairable after an event. Using the natural microbial ecosystem found in cattle fits these criteria. The process has been demonstrated in the lab and is robust. The use of new communications links can connect each operating unit with a central control facility on the island and also to additional support in more distant locations. This remote support will help with training indigenous people how to operate these biological systems safely, efficiently and reliably. Although the technology is advancing rapidly, there remain several technical issues surrounding filtration and product recovery that need to be addressed.

The Transition Initiative as a Grass-Roots Environmental Movement: History, Present Realities and Future Predictions

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The "transition town" or transition initiative as it is now often described, was the brainchild of Rob Hopkins when launching the concept in Totnes, Britain, in 2006. The concept has spawned some hundreds of similar such initiatives in a range of countries around the world as a means for communities to increase their resilience to the future challenges from two major environmental concerns: peak oil and climate change. Although some such initiatives have been very successful, this is not the case with all. Drawing on concepts from Institutional Theory, I propose to analyse the findings from discussions held with individuals involved in specific transition initiatives in New Zealand in order to identify and explore the range of characteristics of successful such initiatives. I will also discuss some of the challenges and difficulties facing such initiatives and highlight some of the conflicts and ironies that emerge from their establishment and growth.

Role of Bering Sea Sub-Network (BSSN) to Map Subsistence Use and Explore Climate Change Impacts and Adaptations

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Subsistence activity in the Bering Sea faces major challenges as a result of climate change. Changing environmental conditions can affect subsistence by disrupting food webs and increasing weather variability. Melting sea ice and warming ocean waters have increased interests in development including marine transport, offshore oil and gas exploration and commercial fishing. Development can have both positive and negative impacts to the indigenous groups who occupy the area. In order to understand impacts of development, maps of subsistence-use locations are needed. Subsistence mapping is commonly done using focus groups of experts who draw lines around areas they use to hunt and gather food. Some individuals are uncomfortable with this nominal delineation as it may reduce their influence on the decision making process for areas outside of

recognized harvest areas. Phase two of the Bering Sea Sub-Network, community-based research, endeavours to address these issues by creating density maps using input from a majority of high harvesters within a community. Density mapping using Geographic Information Systems displays, on an interval scale, areas from high density subsistence use to low. The power of these maps lies in their ability to allow decision makers to rate a project's desirability based on its potential to disrupt subsistence activity. During year three of this seven year project 2052 interviews were conducted with 546 people in 6 indigenous Alaskan and Russian villages bordering the Bering Sea. Respondents circled locations where they harvest and answered questions about those locations. Questions focused on observed changes in the environment, challenges faced while harvesting and general questions about the species harvested. These data can not only facilitate the mapping of harvest locations, but allow researchers to spatially explore the effects of climate change to subsistence activity and resulting adaptations.

Conservation for Freshwater Fish in Japan from the Perspectives of River Management, Global Warming, and Exotic Species Invasions

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Rivers and small impoundments in Japan have been heavily altered in the past half century which resulted in reducing aquatic biodiversity. Stream channelization, reduction of sediment transportation, water quality deterioration, and vanishing riparian vegetation caused local extinction of fish species particularly in urban rivers. I investigated 47 sites in 22 streams in Nagoya, Aichi Prefecture, Japan during 2008-2010, and collected 22 fish species that included four species listed as endangered species in the city. The species diversity was strikingly low compared to 56 fish species recorded in the same area in 1950s. The physical environmental data showed that faster and shallower microhabitat characteristics resulted in less fish species and population abundance. Also, in streams where summer stream temperature was higher, less fish populations were found. Four exotic fish species including largemouth bass were also found and, conversely, they were less abundant in cooler temperature streams. In addition to the investigation in rivers, I investigated a small impoundment where exotic fish dominated over native ones during 2006-2009. Eradication of exotic fish species after draining the pond water and waiting for natural rate of the following recolonization by native fish, several native fish successfully re-established higher population abundance than ever before. In another impoundment, removing exotic fish eggs were also attempted using a device constructed to lure them to spawn where greater than 110,000 eggs were successfully removed. These results suggest that future conservation efforts in urban streams and small impoundments should be directed to implementation of well-designed habitat rehabilitation tools to enhance fish habitat quality as well as diligent and continual effort to reduce population levels of exotic fish.

The role of botanic gardens in biodiversity conservation and sustainable development

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Botanic gardens are institutions holding documented collections of living plants for the purposes of conservation, research, education and recreation. There are over 2,500 botanic gardens all over the world. Botanic gardens have become major centres for the ex situ conservation of rare and threatened plant species.

They play a key role in improving human well-being, which includes improving healthcare, improving nutrition, alleviating financial poverty and providing social and community benefits. They also have important contributions in addressing climate change. The aim of this paper is to highlight the role of botanic gardens in biodiversity conservation and sustainable living.

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Conference Chair and outgoing President,

Dr. Eric J. Fitch,
Marietta College