



Program and Abstracts  
THE 14<sup>TH</sup> INTERNATIONAL  
INTERDISCIPLINARY CONFERENCE ON THE  
ENVIRONMENT

*JUNE 30 - July 3, 2008*  
*Edmonton, Alberta Canada*

*Organized By*  
*The Interdisciplinary Environmental Association*

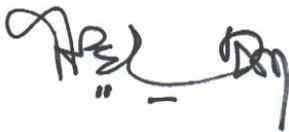
## WELCOME

*Dear Participant*

*On behalf of the Interdisciplinary Environmental Association, I would like to welcome you to Edmonton, Canada, and the 14<sup>th</sup> International Interdisciplinary Conference on the Environment. This year's conference is being held against a backdrop of major environmental challenges, both global and local in character. On the global front, the impact of climate change has made itself felt through the extreme weather patterns being experienced in various regions of the world, while the destruction of the planet's ozone layer continues to threaten all forms of life on earth. On the local front, growing energy and food shortages affect all countries, both developed and developing, but their more serious impacts are being felt most keenly in the latter. It is evident that there is a growing awareness of the significance of these, and other, environmental challenges, and greater efforts are being made, first, to understand them (especially their causes), and, second, to formulate appropriate solutions. Perhaps the greatest challenge that faces us is to promote the international governmental co-operation that is necessary to achieve sustainable development.*

*Each year, the Interdisciplinary Environmental Association seeks to bring together specialists, practitioners, and concerned citizens from all corners of the world and from all disciplines in the natural and human sciences, to exchange ideas and approaches to the myriad environmental problems that confront us. In doing so, we believe that a holistic approach to environmental studies – one that transcends philosophical, political or disciplinary boundaries – offers the greatest opportunity to understand and solve environmental issues. Accordingly, the program for this conference provides an impressive breadth of coverage of topics that will be discussed over the next few days. If this is a return trip to our conference, we hope you will find us more vital and active. If this is your first participation in our conference, we hope you will find our distinctive interdisciplinary approach to environmental issues both challenging and rewarding. You are encouraged to join the Interdisciplinary Environmental Association and assist us in promoting a more holistic understanding of the causes of – and solutions to – the environmental problems that confront us.*

*Welcome to Edmonton and the 14<sup>th</sup> International Interdisciplinary Conference on the Environment. We look forward to meeting – and learning from – each of you.*



*Anthony B. Lumby  
President, 2007-9*



*Eric J. Fitch  
Vice President/President-Elect, 2007-9*

*The Interdisciplinary Environmental Association  
[www.ieaonline.org](http://www.ieaonline.org)*

## CONFERENCE SCHEDULE SUMMARY

	Monday 30	Tuesday 1	Wednesday 2	Thursday 3	
7:30 AM		Registration (to 3PM)	Registration (to 10am)	Gather	7:30 AM
8:00	Field Trip: Elk Island National Park	1) Conservation and Management  2) National and Global Policy in the Face of Climate Change	9) Ethics in Governance  10) Indigenous Reaction to Outside Policy	15) Misperceptions in the Communication of Environmental Concepts  16) New Resources, New Issues	8:00
8:30					8:30
9:00		9:00			
9:30		9:30			
10:00		Break	Break	Business Meeting	10:00
10:30		3) Communities as Actors  4) Climate Change and the Management of Extreme Impacts	11) Approaches to Environmental Education  12) Climate Change: The Human Aspect		10:30
11:00				11:00	
11:30		Break	Break	11:30	
12:00 PM		Field Trip: Fort Edmonton	Lunch	Keynote Address	12:00 PM
12:30					12:30
1:00			1:00		
1:30			1:30		
2:00			5) Ecotourism and Community Displacement  6) Air and Water Pollutants	Conference Luncheon and Presidential Address	2:00
2:30					2:30
3:00			7) Integrated Resource Management  8) Agribusiness and Sustainability	13) Urban and Built Environments  14) Stakeholder and Corporate Adaptation	3:00
3:30					3:30
4:00	4:00				
4:30	4:30				
5:00	Break, Poster Authors Available	Break, Poster Authors Available	5:00		
5:30	Colloquium I: Environmental Programs: Identity and Curriculum – A Prescription for Sustainable Prosperity	Colloquium II – Roundtable Discussion: Core Concepts in Environmental Science/ Studies?	5:30		
6:00			6:00		
6:30			6:30		
7:00	Social			7:00	
7:30		Field Trip: Canada Day Fireworks		7:30	

# CONFERENCE SCHEDULE

## Monday, June 30

8:30am – 5pm Field Trip to Elk Island National Park

All registered participants should wear comfortable attire for an outdoor walk and bring rain gear. Water is recommended. We will stop for lunch in the area. Meet in the hotel lobby; vans depart at 8:00 AM.

Price \$50

7pm – 9pm Informal Social Mixer, Room TBA

## Tuesday, July 1

7:30am – 3pm Registration  
Room

8am – 9:45am Session 1: Conservation and Management

Room: MacKenzie

Moderator: Abigail Amisshah, Slippery Rock University

Discussant: Susan Baker, NOAA/NCCOS

### **Gregory Thiemann**

Identifying Ecological Units of Conservation for Polar Bears in Canada

### **John Vorster**

The Living Museum under Ecological Stress, Case Study of Yala Swamp Beyond 2020-KENYA

### **Peter Beck**

Easy Conservation? Easements as an Incentive for Conserving the Texas Hill Country

8am – 9:45am Session 2: National and Global Policy in the Face of Climate Change

Room: Champlain  
Moderator: Eric Fitch, Marietta College  
Discussant: Charles Simpson, SUNY Plattsburgh

**Takashi Hattori**

Long-term or Short-Term? Japan's Contribution toward the Climate Change Agenda

**Damilola Olawuyi**

Combating Climate Change through Trade Mechanisms: Weighing Options Ahead of the Post 2012 Commitment Period

9:45am – 10:15 am Break  
Room: Foyer

10:15am – 12 pm Session 3: Communities as Actors in Historic Resource Management

Room: MacKenzie

Moderator: Kerri Holland, University of Alberta

Discussant: Takashi Hattori, APEC Secretariat, Singapore

**Angela Angell and Sara O'Shaughnessy**

Natural Resource Development and Social Histories in the Canadian North: A Comparison of the Yukon and Northwest Territories from the 19<sup>th</sup> Century to Present

**Paul Barresi**

Policy-Making for Environmental Sustainability in the United States: Eighteenth-Century Barriers to Achieving Twenty-First-Century Goals

10:15am – 12pm Session 4: Climate Change and the Management of Extreme Impacts

Room: Champlain

Moderator: Ken Hughey, Lincoln University

Discussant: Meenal Shrivastava, Athabasca University

**Eric Fitch**

Interlocking Crises: Water, Energy, Food, Soil

**Patrick Masius**

Human Impacts on the Environment as a Cause of Natural Disaster: Approaching Disaster from a Sustainable Development Perspective

**Charles Simpson**

Food Security and the Doomsday Vault: A Death Grip on a Fallacious Paradigm

12 – 1:15 pm: CANADA DAY BRUNCH

Room: Queen Elizabeth

1:15 pm – 3 pm Session 5: Ecotourism and Community Displacement

Room: MacKenzie

Moderator: Takashi Hattori, APEC Secretariat, Singapore

Discussant: Susan Gill, Stroud Water Research Center

**Jeffrey Roberg**

At What Cost Tourism? Individuals Rights vs. Environmental Rights in Argentina

**Julie Darnell**

Ethical Considerations when Developing Transboundary Peace Parks: Lessons from the Great Limpopo Transfrontier Park

**Penny Seymoure**

Tourism, Development, and Guaraní Communities in Argentina

1:15pm – 3 pm Session 6: Air and Water Pollutants

Room: Champlain

Moderator: Eric Fitch, Marietta College

Discussant: Pierce Lehr, Valparaiso University School of Law

**Mary Richardson**

An Ethical Analysis of the Scientific Weight of Evidence Approach in the Regulation of Toxic Chemicals in Canada

**G. L. Zhang**

Lead Pollution in Air Studied by Nuclear Analysis Techniques

**Pierce Lehr**

“Ethanol the Savior of Rural America”

3:00pm – 4:45pm Session 7: Integrated Resource Management

Room: MacKenzie

Moderator: Mai Kuha, Ball State University

Discussant: Peter Beck, St. Edward's University

**Ken Hughey**

Te Waihora-Lake Ellesmere: An Integrated View of the Current State and Possible Futures

**Susan Gill**

WikiWatershed: Developing Cyberinfrastructure for Watershed Management and Education

**Jeremy Schmidt**

Water and Ethics: Why a New Model for Resource Management is Needed

3:00pm – 4:45pm Session 8: Agribusiness and Sustainability

Room: Champlain

Moderator: Lorelei Hanson, Athabasca University

Discussant: Miriam Esquitin, Agriculture and Food Council of Alberta

**Dalit Marom and Anthony Lumby**

The Case for Contingent Valuation in Valuing Environmental Assets/Services in Cost-Benefit Analysis: A Review

**Kerri Holland**

Canadian Agriculture and the Environment: Transitioning to a New Approach for Sustainability

**Bradley Dollevoet**

Benefit-Cost of Ecological Goods and Services Production by Agricultural Producers in Alberta and Saskatchewan

4:45pm – 5:15pm Break: Poster Authors Available

Room: Foyer

5:15pm – 6:45pm Colloquium I

Environmental Programs: Identity and Curriculum – A Prescription for Sustainable Prosperity

Room: MacKenzie/Champlain

Presenter: *Will Focht, Oklahoma State University*

7:30 – 11pm Field Trip to Canada Day Fireworks

All registered participants should wear comfortable attire for sitting and walking. Meet in the hotel lobby.

### **Wednesday, July 2**

7:30am – 10am Registration

Room: MacKenzie

8am – 9:45am Session 9: The New Ethic in Governance and Economics  
Room

Moderator: Paul Barresi, Southern New Hampshire University

Discussant: Abigail Amisah, Slippery Rock University

**Deborah McGregor**

Indigenous Knowledge and Environmental Ethics: From Guidelines to Governance

**William Holmes**

Institutional Convergence and the New Environmental Ethic

**Mishka Lysack**

Global Warming as a Moral Issue: The Ethics and Economics of Reducing Carbon Emissions

8am – 9:45am Session 10: Indigenous Reaction to Outside Policy

Room: Champlain

Moderator: Susan Baker NOAA/NCCOS

Discussant: Susan Gill, Stroud Water Research Center

**Sue Chiblow**

Aboriginal Traditional Knowledge and Environmental Policy: Ontario's First Nations' Views on Taking Care of the Water

**Teale Phelps Bondaroff**

A Bridge Over Frozen Waters? The Impact of the Anti-Sealing Movement on Inuit and Environmentalist Relations

**Deborah Jackson**

"Shelter in Place": A First Nation Community in Canada's Chemical Valley

9:45am – 10:15am Break

Room: Foyer

10:15am – 12:00pm Session 11: Approaches to Environmental Education

Room: MacKenzie

Moderator: Ken Hughley, Lincoln University

Discussant: Anthony Lumby Witwatersrand University

**Michael Reiter**

Designing an Integrated Transdisciplinary Environmental Science Curriculum Using an IRMA Chart: An Example from Bethune-Cookman University

**Susan Baker**

Games as a Method of Increasing Environmental Literacy and Stewardship

10:15am – 12:00pm Session 12: Climate Change: The Human Aspect

Room: Champlain

Moderator: Meenal Shrivastava, Athabasca University

Discussant: David Parsons, Sheffield Hallam University

**Eric Fitch**

Whither Refuge? Sea Level Rise, the Coastal Margin and Environmental Refugeeism

**Bertrand Guillame**

Facing Global Climate Change: Ethics, Prudence and Action

**Mishka Lysack**

Ecological Grief: An Inquiry

12pm – 1:15pm

**KEYNOTE ADDRESS**

**Edward Struzik**

Room: Queen Elizabeth

1:15pm – 3pm: Conference Luncheon

Location: Queen Elizabeth

**PRESIDENTIAL ADDRESS**

**Dr. Anthony Lumby, President IEA**

3pm – 4:45pm Session 13: Urban and Built Environments

Room: MacKenzie

Moderator: Charles Simpson, SUNY Plattsburgh

Discussant: Eric Fitch, Marietta College

**Chuks Mba**

Urbanization in Ghana: A Call for an Establishment for Research-Based Planning and Management of Metropolitan Areas

**David Parsons**

The Economic and Social Sustainability of Gated Communities

**J. L. Hao**

Integrating Environmental, Economical and Social Aspects for Sustainable Construction

3pm – 4:45pm Session 14: Stakeholder and Corporate Adaptation

Room: Champlain

Moderator: Michael Reiter, Bethune-Cookman University

Discussant: Anthony Lumby, Witwatersrand University

**Kenneth Hughey**

Interdisciplinary Contribution Potential in 'Corporate' Environmental and Social Responsibility Initiatives

**William Holmes**

A Theoretical Framework for Investigating the Determinants of Corporate Environmental Policy

**Flora Lê**

Legislating the Inevitable: Adaptation as a New Paradigm for Climate Change Governance

4:45pm – 5:15pm Break: Poster Authors Available

Room: Foyer

5:15pm – 6:45pm Colloquium II - Roundtable Discussion: Is there (or should there be) a set of critical core concepts in Environmental Science/Studies from which all programs should be developed?

Room: MacKenzie/Champlain

Moderator: *Michael Reiter, Bethune-Cookman University*

**Thursday, July 3**

7:30am - 8am Gather

Room: Foyer

8am – 9:45am Session 15: Misperceptions in the Communication of Environmental Concepts

Room: MacKenzie

Moderator: William Holmes, Simon Fraser University

Discussant: Mary Richardson, Athabasca University

**Mai Kuha**

Uncertainty about Causes and Effects of Global Warming in U.S. News Coverage Before and After Bali

**Teale Phelps Bondaroff**

Swashbuckling Environmentalists: An Examination of the Strategy of Radical Environmentalism

**Nathan Kowalsky**

Rupture: Maintaining Moral Contingency in Environmental Philosophy

8am – 9:45am Session 16: New Resources, New Issues

Room: Champlain

Moderator: David Parsons, Sheffield-Hallam University

Discussant: Anthony Lumby, Witwatersrand University

**S. Jassar**

The Potential for Improving Space Heating Energy Efficiency and Reducing CO<sub>2</sub>

**Jason Barton**

American Importation of Brazilian Sugarcane Ethanol: The Possibilities and Possible Impacts on Land Use and Other Inputs

**Sam Li**

Development of Advanced Analytical Techniques for Monitoring of Emerging Pollutants in Water

9:45am – 11:15am Business Meeting

Room: MacKenzie/Champlain

All participants are welcome to attend.

11:15am – 11:45am Break

Room: Foyer

1-5 pm Field Trip to Fort Edmonton

All registered participants should wear comfortable attire for sitting and walking. Meet in the hotel lobby.

## ABSTRACTS

### 1. KEYNOTE BIOGRAPHIES AND ABSTRACTS (\*Presenter/Contact)

#### Ed Struzik

Ed Struzik is a writer/photographer who has focused on Arctic issues for the past 28 years. During his tenure as the 2006-2007 holder of the Atkinson Fellowship in Public Policy, Mr. Struzik spent the better part of a year in the Canadian North investigating the impact that climate change is having on the environment, Inuit, and First Nations cultures, and the threats it poses to security and sovereignty. "The Big Thaw" (to be published by John Wiley and Sons in 2009) describes what Mr. Struzik found and what these and other findings mean for the future of Canada.

Over the years, Mr. Struzik has received dozens of awards and honors for his work. These include the Knight Science Fellowship at Harvard/MIT, the Southam Fellowship at the University of Toronto, and the Sir Sandford Fleming Medal, which goes to one Canadian each year who has made an outstanding contribution to the understanding of science in Canada. He is also a three-time winner of the Yves Fortier Award (Geological Association of Canada,) a seven-time winner of the Canadian Science Writers Association Award, and a multiple winner of national magazine and national newspaper awards. Canada's Governor General has honoured Mr. Struzik three times with Citations of Merit for his work (Roland Michener Award for Meritorious Public Service in Journalism).

Mr. Struzik is the author of two previous books, Northwest Passage (published by the Canadian Geographic Society) and Ten Rivers (published by CanWest Books).

#### **Keynote Address: This Hour has Fifty-Five Million Years**

Six-foot tall beavers, three-toed horses, scimitar cats, and western camels. Over the past three decades, the discovery of these and other now extinct animals has proven that the Arctic was, at various times, a much warmer place than it has been for more than a million years. Join writer/photographer Ed Struzik as he takes you on a 55 million year-long journey into the Arctic past. Discover what this past tells us about the future for wildlife, the environment, and for people living within and south of the Arctic Circle now that the world is heating up again.

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### 2. CONTRIBUTED ORAL PRESENTATIONS (\*Presenter/Contact)

***Alphabetical by Indicated Presenter. Italicized means presenter had to withdraw.***

#### **Games as a Method of Increasing Environmental Literacy and Stewardship**

Susan L. Baker\*

*Coordinator for Outreach and Education  
National Centers for Coastal Ocean Science  
National Oceanic and Atmospheric Administration  
1305 East West Highway  
Silver Spring, MD 20910  
susan.baker@noaa.gov*

The theory is that individuals pass through progressive stages before implementing a change in behavior. First there is awareness, then engagement, understanding, adoption, lastly behavior change. For environmental issues there are many methods of reaching that first stage of awareness. Traditionally, methods include formal curricula, tours and activities in National Parks and aquaria, and public awareness campaigns. Most of these activities reach individuals who already have some interest in the environment. That is why they went to the National Park, museum, or aquarium. But how can the awareness and engagement in individuals that currently have no or little interest in the environment be increased? By having Fun!

Individuals learn while having fun, without necessarily being aware of how much they are learning. Games can be fun. Environmentally based games can be presented in both traditional and non-traditional settings (e.g., AARP conference). Games can be used in formal or informal educational settings or as an outreach tool. Games can be used to reach naïve individuals as well as those more familiar with environmental issues. Games can be designed for the very young to adults of all ages. Games can be as simple as matching fish halves to as complex as virtual gaming (e.g., Second Life). Games can be printed materials, (e.g., activity books for young kid\_s; they can be interactive competitions, (e.g., Jeopardy or Bingo); or web based interactive applications. Games can include ‘role playing’ scenarios that demonstrate environmental issues. Games can be used to teach or test environmental knowledge. Games can be a very flexible tool to increase environmental literacy and eventually, hopefully, increased stewardship. Examples of a variety of different types of games will be presented, primarily illustrating marine science. The participants will develop an appreciation for the strength and flexibility of using games to increase environmental literacy.

**Policy-Making for Environmental Sustainability in the United States: Eighteenth-Century Barriers to Achieving Twenty-First Century Goals**

Paul A. Barresi\*

*Associate Professor of Political Science and Environmental Law  
Southern New Hampshire University  
2500 North River Road  
Manchester, NH 03106  
p.barresi@snhu.edu*

The concept of environmental sustainability calls for a radical departure from the policy status quo in the United States. Unfortunately, the framers of the federal Constitution created a policy-making process specifically designed to make it hard to make changes of this type. Their goal was to prevent tyranny, which they defined as the accumulation of all governmental powers in the same hands, including the hands of a majority. Toward that end, they created a fragmented policy-making process that from the inside looks like a system of multiple veto points, and from the outside looks like a system of multiple access points, in which policy-makers have both the constitutional means and the personal motives to thwart each others' policy-making efforts. The structural features of this process have three functional consequences. First, they make it much easier for small but relatively well organized minorities to influence policy outcomes than for large but poorly organized majorities to do so. Second, they make it much easier to stop proposals for policy change than to ensure that they become law. Third, they create a systemic bias against proposals for radical policy change. Since ratification of the federal Constitution in 1788, congressional legislation, rules, and customs, and decisions of the United States Supreme Court, have exacerbated these effects. The result is an even more fragmented policy-making process in which the participants are even better able and even more highly motivated to work at cross-purposes, and thus that is even better at achieving the framers' goal of preventing tyranny. This paper explores how and why the federal policy-making process works in this way, and argues that only an acute environmental crisis of national scope is likely to make it possible to achieve more than incremental progress toward environmentally sustainable public policy in the United States. The paper concludes by suggesting that certain threshold effects of global climate change could provide the necessary impetus.

**American Importation of Brazilian Sugarcane Ethanol: The Possibilities and Possible Impacts on Land Use and Other Inputs**

Jason Barton\*

*Faculty of Land and Food Systems  
University of British Columbia  
jasonjbarton@mac.com*

Should the United States open its economy to importation of Brazilian ethanol? What would be the impacts on land use, water, and food security? Rising demand for transportation fuel, in the face of concerns over climate change and dwindling petroleum reserves, has spawned immense interest in biofuels as a politically palatable substitute and complement for petroleum gasoline. While the United States has set Renewable Fuel Standards (RFS) that include thirty-six billion gallons of renewable fuels by 2022, others are skeptical that this demand can be met domestically.

Meanwhile, Brazil was the leading producer of ethanol until just 2005, and the efficiency of its sugarcane-based ethanol is unmatched by any other feedstock available in the North. Producers and investors are currently trying to streamline supply so as to increase potential exports, but finite amounts of land and this year's global food crisis brought on in part by diversion of food to biofuels production require careful study of the impacts of importing Brazilian ethanol on ecology, economies, and food security. This study uses the most optimistic and reliable production data and projections for inputs and yields of Brazilian sugarcane to find that meeting one half of the US RFS for 2022, and adding that to current Brazilian ethanol production would require just over 13% of all of Brazil's arable land. The draft of the paper below is a working draft and improvements are currently ongoing. In the coming weeks data will be added that describe current food production in Brazil and Sao Paulo, Brazil's largest sugarcane producing state, to provide a picture of the kinds of foods and amounts (measured in weights and kilocalories) that may be replaced by cane production for ethanol.

### **Easy Conservation? Easements as an Incentive for Conserving the Texas Hill Country**

Peter Beck\*

*Assistant Professor of Environmental Science and Policy  
St. Edward's University  
Austin, TX*

This paper examines the effectiveness of conservation easements as an incentive for landowners to relinquish developing their land. Through exchanging tax breaks for development rights, easements address some of the primary limitations of land conservation: the high cost and frequent public antagonism towards public purchases of land and overcoming the potential economic cost to the landowner of not developing land (Boyd et al, 2006). As a result, easements are popular with both conservationists seeking to restrict development as well as free market and property rights advocates who oppose government regulation. However, despite increasingly representing the dominant tool for conserving land (King & Fairfax, 2005), the literature on easements is inconclusive as to their effectiveness at actually encouraging conservation decisions by reluctant landowners (Parkhurst & Shogren, 2005). This paper presents findings of field research conducted in the Texas Hill Country, west of Austin and San Antonio, an area experiencing rapid population growth in a state where 94% of the land is privately owned. Given these constraints, public and private organizations have relied heavily on easements as a means of slowing development. Results indicate that easements are effective for landowners who already value land preservation by enabling them to formalize and receive tangible benefits from a conservation decision. However, for landowners who are open to the possibility of development, more extensive incentives than the limited economic benefits offered by easements will be required to encourage participation.

### ***Ecosystem Service Preferences of Environmental Actors in Bangladesh***

*Shampa Biswas\* and Harald Vacik*

*Institute of Siviculture (Institut für Waldbau)*

*Department of Forest- and Soil Sciences*

*BOKU - University of Natural Resources and Applied Life Sciences, Vienna*

*Shampa.bd@gmail.com*

*The socio-economic and cultural life of forest dwellers in Bangladesh is closely related to forest. With every hectare of forest lost to agricultural expansion, urbanization and logging, the flow of forest environmental goods and services is diminished. This loss represents an uncalculated risk which is multiplied in the context of climate change. This risk is unknowingly borne by many stakeholders (such as the public, industrial and agricultural sectors, water and power utilities and many others) that depend on forest environmental services (FES). Mitigating this risk and adapting to climate change requires a strategic approach to securing ecosystem services. According to the demand of global climate change, ecosystem services draw increasing attention from the public and private sectors to foster sustainable forest management (SFM). Because forests provide lots of ecosystem services like biodiversity, carbon sequestration, water cycling and scenic beauty. Global scientists think that carbon projects within naturally managed projects provide not only environmental benefits compared to conventional timber logging, but also enlarge the products portfolio of sustainable managed forests. In Bangladesh, the idea of ecosystem service is not well known and described till now. As the requirement of SFM is participation of multiple stakeholders either for benefit sharing or in decision making, so the provision of ecosystem services based on principles of SFM are subject*

*to complex decision making process. It is very requisite to know the preferences of environmental actors for ecosystem services in decision making for SFM. The establishment of market for ecosystem services might afford profits for local landowners and forest conservationists. It would ensure the preferences of environmental actors about the economic significance of the global loss of biological diversity relevant with ecosystem services.*

**A Bridge Over Frozen Waters?  
The Impact of the Anti-Sealing Movement on Inuit and Environmentalist Relations**

Teale Phelps Bondaroff\*  
*Political Science and International Relations  
University of Calgary  
Calgary, Alberta, T2N 1X1  
phepps@hotmail.com*

Anti-fur and animal rights organizations scored an outstanding success, when the European Economic Community (EEC) forbade the importation of commercially hunted sealskins in the eighties. The ban was a result of a concerted international effort, which engaged in a highly visible and expensive campaign to stop the harvest of seals in the Canadian north. The EEC ban and its subsequent, unintended negative economic impact on Inuit communities, resulted in the Inuit developing an extremely negative stance with respect to the environmental and animal rights groups. The matter of sour relations between these organizations and the Inuit is of great importance. Strained relationships between the Inuit and environmentalists mean that each of the groups is alienated from a potentially valuable ally and an enormous amount of collaborative and cooperative potential has been lost. The need for collaboration is greatly increased in the face of unified scientific evidence that the Arctic, once considered pristine, now faces some of the worst environmental problems on the planet.

This paper will discuss the causes and nature of the strained relationship that exist between the Inuit and international environmental and animal rights organizations, and will consider the possibility of reconciliation. It will be put forth that there is a potential for collaboration between Inuit and mainstream environmental and animal welfare organizations, despite a history of confrontation and mistrust as a result of the anti-seal protests. The possibility for reconciliation is directly related to the nature of the involvement of organizations in the anti-sealing protests. Groups that withdrew once the long-term viability of the harp seal was assured, have been able, with considerable effort, to bridge the rift created by the anti-sealing campaigns. Groups which remained involved during the early eighties or which continue to campaign against the seal hunt, especially the more radical IFAW and the Sea Shepherd Society, are viewed with distain in the North, and have very little chance of collaborating with the Inuit.

**Swashbuckling Environmentalists: An Examination of the Strategy of Radical Environmentalism**

Teale Phelps Bondaroff\*  
*University of Calgary  
Political Science and International Relations  
Calgary, Alberta, T2N 1X1  
phepps@hotmail.com*

A growing sense of urgency within the environmental movement has caused many activists to radicalize, and adopt more violent forms of protest, resorting to acts of sabotage and property destruction such as tree-spiking, 'monkey-wrenching' heavy equipment, or fire-bombings. These acts have been branded as acts of terrorism, or ecoterrorism, yet they differ from what is conventionally considered terrorist activity. This paper defines actions which seek to cause material damage as acts of ecotage. Through an analysis of the strategic reasons why ecotage is employed, ecotage can be distinguished from acts of terrorism. Ecotage has been adopted by environmental organizations such as Earth First! (EF!), the Environmental Liberation Front (ELF), and the Sea Shepherd Society for three primary reasons. First, ecotage produces powerful images (mind-bombs) that garner media attention and in so doing generate public awareness and sympathy for a particular issue. Secondly, ecotage is employed in order to cause enough property damage to drive up the costs of doing business to the point where the profitability of environmental degradation is so high that companies are forced to halt operations. And thirdly, organizations that engage in ecotage expand the environmental spectrum, resulting in other, more conventional organizations being considered as moderates. The ultimate goal of radical organizations that practice ecotage is the same as that of most conventional

environmentalists; they seek to protect the environment, yet through their more violent tactics it is clear that they have adopted a divergent strategy. However, as is demonstrated by an understanding of this strategy, these tactics do not constitute acts of terrorism.

**Aboriginal Traditional Knowledge and Environmental Policy:  
Ontario's First Nations' Views on Taking Care of the Water**

Sue Chiblow\*, MEM  
*Environment Coordinator, Chiefs of Ontario*  
65 Mauheenguh  
Garden River First Nation  
Sault Ste. Marie, ON P6A 6Z6  
[sue@coo.org](mailto:sue@coo.org)

First Nation participation in environmental decision making is increasingly recognized as vital to the move towards greater sustainability. Particularly in the international context, there is increasing recognition that indigenous peoples around the world have important contributions to make in all areas of culture, science and technology. In Canada, the importance of indigenous knowledge or Aboriginal Traditional Knowledge (ATK) is also gaining recognition. As the stewardship rights and responsibilities of First Nations, Inuit, and Métis people are being recognized in the courts, public environmental policy must also evolve so as to recognize these rights. As legislation pertaining to water is being proposed and federal strategies are being implemented, Ontario's First Nations are voicing concern about not only their lack of input in these initiatives, but also the virtual absence of any cultural reference therein. The Chiefs of Ontario Environment Department has been working with the Elders and knowledge holders for several years to gain further insight on First Nations views on taking care of the water through a series of workshops and interviews. This paper consists of key messages such as "water is alive and is life itself", a summary of findings and recommendations on a path forward in protecting the water. As part of the summary of findings, the Elders and knowledge holders continuously express the urgency for their messages to be heard at all environmental forums so that we can work collaboratively and in true partnership to ensure First Nation participation in all environmental policy development.

**Ethical Considerations when Developing Transboundary Peace Parks:  
Lessons from the Great Limpopo Transfrontier Park**

Julie Darnell\*  
*Ethics, Peace and Global Affairs*  
School of International Service  
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Transboundary Peace Parks are being embraced as the newest development panacea. Touted as solutions that assuage historical tensions between neighbors and foster cooperative relationships, peace parks are attractive in their multi-faceted benefits. Not only do they have the potential to improve neighborly relations, peace parks are being created and funded as ecotourism destinations that could provide much needed economic stimulus to struggling rural areas with high unemployment rates. Peace parks have the added benefit of helping developing countries meet international development goals such as Millennium Development Goal #7 pertaining to environmental sustainability. Combined, these incentives have attracted the funding and support of international development organizations such as the World Bank, KfW Development Bank, USAID, and UNDP, as well as environmental organizations such as IUCN, Conservation International, and the World Wildlife Fund. In the excitement of implementing a solution that could address so many problems related to development and the environment, ethical considerations are sometimes overlooked and could play an important role in the success or failure of the endeavor. This paper explores the ethical issues faced by the Great Limpopo Transfrontier Park in Southern Africa. These include the displacement of indigenous people; the re-introduction of wild animals to areas inhabited by people and other issues related to conservation versus development; the utilization of traditional cultures as a tourist draw; and the role of international institutions, local governments and South Africa, the regional hegemon.

## **Benefit-Cost of Ecological Goods and Services Production by Agricultural Producers in Alberta and Saskatchewan**

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Ecological Goods and Services (EG&S) are the direct and indirect benefits derived by humans from ecosystems. Examples of ecological goods include clean air and abundant fresh water; ecological services include purification of air and water, and maintenance of biodiversity. Agricultural producers provide EG&S through the preservation of healthy ecosystems. Within agricultural production systems, EG&S may be increased through the adoption of Best Management Practices (BMPs) by producers. However, while this adoption may represent increased benefits to society; these benefits may come at a net cost to agricultural producers. Thus, policy intervention in the form of financial incentives or regulations may be necessary to achieve desired levels of EG&S. The main objectives are:

- to provide an overview of EG&S issues from the farm perspective in W. Canada
- to assess the cost/benefit tradeoff for producers in implementing EG&S
- to evaluate the potential effectiveness of alternative policies for achieving EG&S

Our most recent studies examine the direct on-farm benefit/cost tradeoff associated with increased production of EG&S for farmers in the Lower Little Bow and Lower Souris watersheds in Southern Alberta and SE Saskatchewan respectively. A recent study simulated adoption of BMPs for riparian areas in the Lower Little Bow river basin for a representative crop-livestock farm over a 20 year time horizon. The direct on-farm costs and benefits of adoption were quantified and the net cost ranged from \$45 to \$195 per acre on an annual basis. This model is extended to the Lower Souris watershed. Implications from these studies and completed studies in SW AB on rangeland riparian areas and central Saskatchewan wetland drainage will be presented to provide additional insights into the benefits and costs of farms providing EG&S. Study implications can be used to guide policymakers to achieve desired environmental outcomes.

## **Interlocking Crises: Water, Energy, Food, Soil**

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Professional journals and the popular media have been speculating on solutions to three global resource crises: peak energy, fresh water depletion and soil/arable land loss. Often, solutions to one crisis rely on increasing exploitation of one of the other resources. For example, contemplation on energy and transition from fossil fuels often leads to biofuels, but biofuels especially those based on corn, soybeans and other food crops leads to soil depletion. Increasing food resources often involves increasing use of scarce water resources, oil and natural gas for fuel and chemicals (fertilizers, pesticides, etc.), and the soil itself. Solutions for increasing water resource availability involve taking water away from agricultural use. Other solutions for making “new” water resources especially reverse osmosis desalinization rely on relatively cheap, plentiful energy resources. This study will examine from a national and global standpoint what some of the more critical questions in this nexus of crises and what the implications are for creating solutions.

## **Whither Refuge? Sea Level Rise, the Coastal margin and Environmental Refugeism**

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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 metropolitan centers, and overall highest population concentrations nationally. In the United States, concern has risen about the impact of sea level rise on the Florida Keys, coastal barrier islands, and low lying urban areas such as parts of New Orleans and New York City. In countries like the U.S. which have a significant hinterland planning discussions generally revolve around what can be done to physically prevent loss of lands and/or where to retreat above the “rising tide”. What 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. Tuvalu and Bangladesh are being confronted with the loss of most of their habitable lands in less than 50 years if the rate of sea level rise follows the current projections. Kiribati and the Sundarbans have already lost islands to the sea. Nauru has to mine out its phosphate resources to fund an exodus. 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. Where will environmental refugees 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?

**WikiWatershed: Developing Cyberinfrastructure for Watershed Management and Education**

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There is a growing consensus that the supply of clean water has reached crisis proportions. In the face of declining government budgets, citizens are becoming more involved in seeking solutions and monitoring resources. To be effective stewards, however, consumers, watershed organizations and even municipalities need greater access to information about water quality and quantity. Because data on specific streams – much of it legally public – is often difficult to get, there is a critical need to create an easily accessible way for people to share water data and related information. Increasingly, citizens turn to the Internet to locate a broad range of information - from movie reviews to medical advice. In the last few years the Internet has spawned creative of solutions to a variety of daunting tasks. A well-known example is Wikipedia, where tens of thousands of volunteer contributors have collectively created an “encyclopedia of everything” that has proved to be nearly as accurate as the Encyclopedia Britannica. Sites such as YouTube® and MySpace® are tapping into the desire of many people both to become members of a community of people with similar interests and to contribute to something larger than themselves. Furthermore, sites such as GoogleEarth® have transformed the ability of the average individual to view the world and to share information about it. WikiWatershed uses publicly-available geographic information, existing water-quality data, and established community networks to develop a cyber-community that uses a Global Awareness layer to share information through the Google Earth® portal. As the name implies, WikiWatershed is an open-source, open-information collaborative, allowing users not only to access existing data and tools, but also to contribute data, photographs, and videos; share educational and training materials; communicate ideas; and, develop models and simulations to share with other users. By leveraging existing internet tools (e.g. Google Earth®, You Tube®, Picasa®) and widely available technology (e.g. cell phones, PDAs and other handheld devices), WikiWatershed encourages users to expand skills currently used primarily for recreation and social networking and move them into the educational and professional arenas.

**Facing Global Climate Change:**

**Ethics, Prudence and Action**

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Jean-Pierre Dupuy's Enlightened Catastrophism provides a stimulating framework for the important issue of climate change ethics. It is also an original charge against the Precautionary Principle. I think Dupuy has highlighted critical issues, but I am not sure that he has found the solution to cope with the "Perfect Storm" of global climate change. I am first going to discuss his framework. I will sketch it by focusing on three especially salient issues, namely objective uncertainty, counter-factual thinking, and what could be labelled as "impossible necessity". These three features make Dupuy deny that the precautionary principle can face the catastrophic consequences of the hubris of massive technology development on an industrial scale. This is a surprising claim, especially since opposing charges have often been put forward, criticizing the precautionary principle as being too restrictive and absolutist. Drawing on Ivan Illich and Hans Jonas, Dupuy offers a new philosophical attitude to take seriously the possibility of catastrophes and better face global threats such as environmental ones. His so-called Enlightened Catastrophism will imply that we are not facing risk, but fate, the latter being nonetheless avoidable. In one sense, this theory implies that we should not talk about "risk" (something that has to be managed and controlled) but about "evil" (something that opens to metaphysical thinking). I shall then discuss two points in the context of global climate change. The first point regards prudence as a consequentialist argument for non-regret action. I will claim that the recommendations of mere prudence coincide with those of Dupuy's radical ethics and that they do not need to be opposed. That is to say that both approaches of rationality urged to cut carbon emissions and call for other non-regret strategies. The second point regards our incredulity regarding the occurrence of hyperbolic catastrophes as a consequence of more pragmatic causes than metaphysics. That is not to say that Dupuy's reference to metaphysics is wrong or irrelevant, but that we can adopt a lower level of analysis, with doubtless more operationalisation. Indeed, it seems that focusing on cognitive, organisational, political reasons allows more practical recommendations that I will review.

#### **Integrating environmental, economical and social aspects for sustainable construction**

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Sustainable development has been promoted as a global mission to ensure that the satisfaction of present needs does not compromise the ability of future generations to meet their own needs. Construction industry and its relevant activities are considered as major contributors to environmental pollution and adverse effects on the mission of sustainable development. Therefore, the sustainability performance of individual construction projects is an indispensable aspect to the attainment of sustainable development. This paper presents an approach to integrate environmental, economical and social aspects to help understanding the factors affecting construction sustainability performance across project life cycle.

The appreciation to the significant impacts of construction activities on sustainable development has led to the development of various management approaches for advising how to attain sustainability performance in construction activities. In particular, methods for improving environmental performance in construction have been well investigated. However, the fragmentation in using these approaches results in their limited effectiveness in the contribution to sustainability performance. It is considered that the lack of integration and cooperation among various construction participants is a major reason for this fragmentation. There is a lack of consistent and holistic vehicle to help various participants to work in cohesion. The provision of the integrating approach in this paper enables concerned parties in construction activities to understand the attributes affecting project sustainability performance in a consistent way. This understanding will improve the cooperation between all parties for attaining better project sustainability performance.

## **Long-term or Short-term?: Japan's Contribution Towards the Climate Change Agenda**

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The paper examines divergence and continuity of Japan's efforts to contribute to international arrangements on climate change. In 1990, Japan developed two initiatives; the first one was a long-term plan ("The New Earth 21") for the next 100 years and the second one was a short-term plan ("Action Plan") which set the emission targets by 2000. These formulations in Japan were presented to the international arena in order to contribute to the negotiation process of the United Nations Framework Convention on Climate Change (UNFCCC). After the two decades since then, in 2008, Japan will host the G8 Summit and set the climate change agenda as one of the top priorities for the Summit. In 2007, Japan produced a new proposal ("Cool Earth 50") seeking for a long-term goal, and recently in 2008, Japan indicated its intension on its short-term goal. The paper compares Japan's plans in the two periods and examines what has changed and what has not changed since the early stage of Japan's policy formulation. The paper draws lessons for the current debates for the Bali Roadmap.

## **Canadian Agriculture and the Environment: Transitioning to a New Approach for Sustainability**

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As the resource economy in Western Canada has considerably grown in recent years, so too have concerns over the environmental impact of such development. The agricultural sector is one industry that has gained considerable focus not only in terms of the shift towards more intensified production and issues of environmental stewardship, but also in the policy measures governments at all levels have taken through legislation, regulations, and programming. In recent years, discussion has taken place at all levels of government to address the short and long-term goals of environmental sustainability, especially as it relates to economic development.

As environmental degradation is often directly linked to economic development, the term 'sustainability', has become part of a popular discourse that essentially supports that a strong economy and a healthy environment do not come at the expense of the other, but rather can mutually exist and benefit each other. While the conceptual foundation of sustainability may be perceived as overly optimistic, the attempt to work towards a balance between economic prosperity and environmental stewardship is not unrealistic, nor unattainable. The real challenge is to develop strategies that maintain the ability for the agricultural industry to expand and prosper, while understanding that future objectives can only occur if the environment is able to accommodate growth. With a specific focus on the primary agricultural industry (grains, livestock) in Western Canada, my research intent is to provide a critical overview of the attempts (and lack thereof) of the federal and provincial governments to establish effective environmental policy and programming. Given that jurisdiction over agriculture and the environment are constitutionally shared between the federal and provincial governments, the obvious overlap has often produced policies and programming that lack clarity and consistency. It will be argued that aspirations towards economic prosperity, social stability, and environmental maintenance are possible if the integrating focus for the future encapsulates government coordination, industry cooperation, public support for incentive programs, and clear goals to measure and evaluate success. In recent years, the primary agricultural industry has suffered from low commodity prices, rising input costs, consistent years of bad weather, and trade disputes to the point that it has often been described to be in 'crisis'. As such, the policy initiatives that establish restrictions or incentive programs towards environmental management are critically important to ensure farm operations are able to meet changing environmental standards.

The research that I am proposing is important for many reasons. First, working towards the goal of sustainable agriculture will enable the agri-food system to continue meeting society's need for safe and nutritious food, while conserving natural resources, and ensuring economic viability for producers. Secondly, issues relating to agriculture such as trade and environmental protection transcend provincial and national borders and establish our nation's capacity to access economic markets and maintain good foreign relations. Third, striving to reach objectives of sustainable management that encompass economic, social, and environmental considerations is greatly connected to

the quality of life that all Canadian citizens enjoy. As such, the relationship between the agricultural industry and the environment must be approached in a coordinated and effective manner. This research endeavour will analyze the interconnection between agriculture and the environment, assess recent government strategies, and present suggestions for future improvement in this important area of public policy and political science.

### **A Theoretical Framework for Investigating the Determinants of Corporate Environmental Policy**

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Factors influencing corporate environmental policy decision-making often result in the formulation and implementation of significantly different environmental policies in firms of similar size in the same industry. This paper contends that a combination of stakeholder theory and new institutionalist theory can be used to explain the reasons behind these differences. A complex network of interrelationships between internal and external stakeholders together with macro level institutional influences and micro level intra-firm dynamics is ultimately what influences decisions made and actions taken in corporate environmental management. In their attempts to predict the impact and subsequent levels of success resulting from their decisions, it is essential for corporate environmental policy decision-makers to have an awareness and understanding of the complexity of these networks.

This paper constructs a theoretical framework which combines stakeholder theory with new institutionalism to illustrate the complex interactions between external stakeholder influences and intra-firm dynamics which determine environmental policy formulation and adoption by individual corporations. Combining these theories allows the deconstruction of the firm to determine how the interrelationships between a firm's decision-making structures, its intra-firm political dynamics and the policy preferences of individual managers all contribute to a firm's environmental policy decisions when faced with the myriad of often conflicting pressures and influences exerted by stakeholder groups. This framework can also be used to help to explain the reasons why firms with similar characteristics in the same industry facing essentially the same influences make substantially different kinds of environmental policy decisions.

Stakeholder theory posits that it is in the best interest of the company to consider and address all demands made by stakeholder groups voicing an interest or claim on the company. While these demands may seem contrary to the profit motive attributed to the stakeholders with ownership interest, ignoring these demands may have negative implications for profitability in the longer term.

New institutionalism examines the relationships and dynamics of political and economic behaviours within the institutional context. As a theoretical movement, new institutionalism arose from the need to understand the role that institutions play as determinants of the outcomes of interactive human behaviour in various social and/or organizational settings. Institutions are defined as sets of rules, customs and practices that define social behaviours. These institutions include legal systems, religious belief systems, structures of property rights and programs or customs that define societal practices. New institutionalism holds that the individual managers are each influenced by a broad range of institutions which ultimately affect their collective decision-making at the corporate level. Where new institutionalism differs from stakeholder theory is in its recognition that the decision-making process at the firm level depends on the organizational decision-making structures and political interrelationships within each firm as well as the talents, resources, endowments and preferences of individual managers.

The rationale for combining stakeholder theory and new institutionalism in a theoretical framework is straightforward. Stakeholder theory illustrates influences that are exerted on a firm and its managers as it attempts to develop its environmental policy. New institutionalism explains how macro level institutional influences combined with the internal dynamics of a firm determine which environmental policies are adopted and implemented within a particular firm.

## **Institutional Convergence and the New Environmental Ethic**

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Events such as wars, disasters and security threats have historically contributed to creating environments that facilitate rapid social change. These events galvanize and unify disparate groups within society into working towards a common purpose. This common purpose unifies the interests of society and its institutions creating an environment that lowers barriers and creates opportunities for social changes and technological innovations that address the crises.

New institutionalism examines the relationships and dynamics of social, political and economic behaviours within the institutional context. As a theoretical movement, new institutionalism addresses the need to understand the roles that institutions play as determinants of the outcomes of interactive human behaviour, or the links between micro-motives and macro-behaviour in various social settings. Institutions are sets of rules, customs and practices that define social behaviours and include legal systems, religious belief systems, structures of property rights and programs or customs that define societal practices. These institutions assign roles to individuals participating in those practices and guide the behaviours and actions of the individuals who occupy those roles. When adapted to an organizational context, new institutionalism examines the relationships and dynamics of intra-firm characteristics such as corporate culture, organizational hierarchies, decision-making structures and leadership styles to determine their effects on decisions made in an organization.

Institutional convergence resulting from the impending global environmental crisis is already under way as evidenced by the increasing level of activity within both public and private sector policy regimes and in the acceleration of entrepreneurial activity in the clean technology sector. The process of institutional convergence and the subsequent social change will continue to accelerate until the damage to the environment from human activity is brought under control to the point where it can be reversed, halted or at least effectively managed.

This paper contends that institutional convergence will lead to an acceleration of environmentally responsible policy decisions at the institutional level and the organizational level. As the time-line shortens, institutional convergence will empower decision-makers to be increasingly bold in their pro-environmental stance, creating a favourable environment for aggressive policy and technological innovation with respect to environmental issues. This paper reviews the literature on new institutionalism and constructs a theoretical framework to illustrate how the current global environmental crisis is facilitating the convergence of the goals and objectives of society and its institutions.

### ***Towards Acceptable Change: A Thresholds Approach to Cumulative Effects Management***

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*Conventional approaches to land use planning involve a linear process of identifying a goal and identifying the best way and implementing the solution. As such, preference may be given to scientific approaches to solving natural resource management problems in order to identify the “best” solution. Yet, as we know, land and resource management decisions are messy exercises of negotiation between stakeholders who have different and sometimes competing interests. One approach to managing cumulative cultural and environmental effects is to apply thresholds to human land disturbance, based on a blend of ecology and sociology. A threshold is the point at which an indicator changes from an acceptable to unacceptable condition, defined from an ecological and/or social perspective. The use of thresholds in landscape management can help ensure that human activities do not cause*

*irreversible or undesirable environmental or social consequences. Determined at the regional or sub-regional scale, thresholds can be set to protect ecosystem components for future generations. At the project level, thresholds can provide guidance to decision makers on the significance of a project's contribution to cumulative effects. To select thresholds, stakeholders and planners must first identify the conditions and components of the landscape that are desirable and of highest priority.*

*In September 2005, a group of landowners, industry, environmental groups and local governments launched an ALCES (A Landscape Cumulative Effects Simulator) project to assess the cumulative impact of future land use in southwest Alberta, called the Southern Foothills Study (SFS). Lessons from this case study and recommendations from thresholds-based management are provided on participatory approaches to the development of thresholds, modeling future land use change and the incorporation of social values into decision-making.*

### **Interdisciplinary Contribution Potential in 'Corporate' Environmental and Social Responsibility Initiatives**

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'Corporate', including business and central and local government, approaches to environmental and social responsibility have 'taken off'. Initial approaches included emphasis on cleaner production, then shifted to process-based and certified environmental management systems (EMS) like ISO14001, then to complementary goal-based (e.g., The Natural Step) systems, Life Cycle Analysis, the Triple Bottom Line, and now to Sustainability Reporting and the like. Much has been written in support of EMS from descriptive, philosophical (why they are good things to do and have), and marketing perspectives, ultimately aimed at increasing the rate of system adoption. But while there is increasing evidence of a growing critical disciplinary literature, there is little evidence of a broadly-based interdisciplinary input or critique occurring that might contribute to novel thinking and action in terms of (i) design, (ii) adoption, or (iii) evaluation of system performance. In this paper I describe the current approaches to research and application in these three areas, outline findings from a potentially integrated case application to a small local authority in New Zealand, identify interdisciplinary opportunities, and outline some of the ongoing challenges.

### **Te Waihora-Lake Ellesmere: An Integrated View of the Current State and Possible Futures**

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Te Waihora-Lake Ellesmere is a coastal lagoon and is New Zealand's fifth largest lake. It is important to Ngai Tahu for wildlife, its botanical features, and indigenous fisheries. It retains recreational values, but one has disastrously declined – the trout fishery. Agriculture and commercial fishing are important, although the former is a key driver of change. These values and related drivers of change combine and interact in complex and often non linear ways. Given these considerations we used a Delphi approach and a diverse multidisciplinary forum to ultimately identify possible future management actions. Concurrently we have developed a model of the system, used adaptive cycles as a way to consider resources, responses and interactions; evaluated overall state of the lake; identified drivers of change to indicators/values; suggested desired futures and associated management actions. These findings and ongoing actions to improve the lake are outlined in this paper.

### ***Evaluation of Eco-Environmental Vulnerability Using RS and GIS:***

#### ***Case of Ma Keng Iron Mining Area in Fu Jian Province, China***

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*Mining activities are always associated with disturbances and negative eco-environmental changes to the natural ecosystems due to vegetation clearing, soil and water quality degradation, and air pollution. Ma Keng mining is the biggest iron mining in the Eastern China. The area has undergone severe eco-environmental changes due to the increasing of human activities aiming at exploring the iron ore and other minerals. Mining activities are accompanied by other human activities which include roads and industries construction, clearing of vegetation, construction of workers houses, sedimentation ponds and tailing dams. Soil-water erosion is acute because of the vegetation cover removal and is worsened by the mountainous nature of the area. The aim of the research was to evaluate the eco-environmental vulnerability of Ma Keng mining area for the past fifteen years using a numerical environmental evaluation model. Application of GIS and RS technology, assisted by statistical software (SPSS), enabled the extraction and preparation of eco-vulnerability factors, and development of the environmental numeric model which was eventually used to evaluate eco-environmental vulnerability of Ma Keng Mining area. Nine eco-environmental vulnerability variables were included in the model namely slope, elevation, soil types, land use, vegetation types, industrial dust pollution, industrial sulfur dioxide gas (SO<sub>2</sub>) emission, and soil erosion. The EVI of the study area for the years 1992, 1998, 2001, 2004 and 2007 were calculated using the environmental numeric model and the results were classified using the cluster principle. The research results showed that the Eco-environmental vulnerability integrated Index (EVI) was increasing with time as from 1992 to 2007. The results further revealed that the eco-vulnerability degree is vertically distributed, whereby the low elevations regions are worse than those in higher elevations. To reverse the intensification of eco-vulnerability, improvement in implementation of voluntary and legal environmental protection measures, and ecosystem approaches are required.*

**“Shelter in Place”: A First Nation Community in Canada’s Chemical Valley**

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The region of southwestern Ontario that includes the city of Sarnia and several townships to the south is known as Canada’s “Chemical Valley.” This moniker signifies the heavy concentration of petrochemical refineries and related industry there, and was coined during a time when such industry evoked images of prosperity rather than pollution. Now, after fifty years of growth, the negative effects on human health and the environment are coming increasingly into public awareness. One especially stark indicator of potential health risks caused by industry is a public service announcement, routinely shown on local television channels, in which residents are instructed what to do in case of a dangerous gas emission from one of the nearby plants: they are advised to “shelter in place,” that is, to stay indoors with windows tightly closed. While all residents of Chemical Valley are affected, the community that has borne the brunt of environmental toxins and resulting health problems is Aamjiwnaang—an Anishinaabek (Ojibwe) reserve which is now nearly surrounded by heavily polluting industrial installations. Given the extent of environmental degradation already suffered by the Aamjiwnaang community, it is difficult for most outsiders to understand why so many band members choose to remain on the reserve rather than moving elsewhere. This paper, based on six months of ethnographic fieldwork in Chemical Valley, addresses that question, giving special attention to Anishinaabek notions of place and community. Despite significant threats to health and quality of life on this piece of land that sits at the heart of the Ojibwa Nation’s traditional territory, Aamjiwnaang band members remain on the reserve for a variety of economic, social, cultural, and political reasons. Throughout these various motivations runs a theme of finding and giving “shelter” that, I argue, imparts a very different meaning to the public service announcement’s ominous phrase, “shelter in place.”

**The Potential for Improving Space Heating Energy Efficiency and Reducing CO<sub>2</sub> Emissions**

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Climate change (global warming), caused by greenhouse gas (GHG) emissions resulting from human activity is an extremely serious global threat. 60% of warming effects come from CO<sub>2</sub> emissions. The Building sector is the greatest source of GHG emissions. Therefore, immediate action in the Building Sector is essential to avoid hazardous climate change. With only 0.5% of world's population, Canada produces 2.3% of global carbon emissions. Tackling CO<sub>2</sub> emissions involves improvement in energy efficiency. This can be achieved in the building, transport and industrial sectors. Over 200 technical energy efficiency measures have been identified in the building sector. A Major area of interest is efficient space heating and water heating. The largest proportion of energy is used by space heating. This paper gives an efficient method for space heating. The author has reviewed current heating system control practice in Canada. This is concluded that conventionally the boilers in space heating systems are controlled by open loop control systems as it is very difficult to measure overall comfort level in the buildings. The paper presents a Neuro-Fuzzy based inferential sensor that can be used to design closed-loop boiler control schemes. Simulated results show that the proposed technique results in energy savings of 18% and significant reduction in CO<sub>2</sub> emissions. The scheme is cost-effective and can make a very large contribution to tackle the problem of CO<sub>2</sub> emissions. Some effort can be made in future to investigate, how the quality of training data influences the long term accuracy of the inferential sensor and control performance of the space heating can be improved significantly.

### **Rupture: Maintaining Moral Contingency in Environmental Philosophy**

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One of the more important exchanges in environmental philosophy is between Holmes Rolston, III and J. Baird Callicott. Most prominently, they disagree over how subjective or objective the *intrinsic* value of nature is. Lying behind this, however, is a more fundamental disagreement, one which Callicott thinks is more divisive than the former, namely the relationship between nature and culture. Rolston is a nature-culture *dualist*, whereas Callicott is a nature-culture *monist*. This difference in basic metaphysical outlook shows up more explicitly in the larger debate concerning the concept of *wilderness*. Rolston defends the notion of wilderness as crucial to environmentalism, whereas Callicott critiques it as harmfully dualistic. Moreover, their unresolved conflict over monism and dualism threatens to further destabilise the underpinnings of the environmental movement by *normalising* environmental degradation either way. Callicott, as a monist, argues that Chicago is just as “natural” as the Great Barrier Reef, but Rolston points out that this makes Chicago's pollution natural too. Thus Rolston concludes that humans and their artifacts are radically distinct from nature. This, however, normalises a schism between human beings and their natural surroundings. Neither option seems environmentally acceptable. I argue that environmental theory must be more critical of the nature and varieties of human culture. Callicott's monism cannot adequately do this, because any and all human cultures are considered equally *natural*. Rolston's dualism, by contrast, ends up making any and all human cultures culture essentially *unnatural*. I propose that we use *rupture*, a value-laden intermediary concept, to map the ways in which human cultures can move between dualisms and monisms. This conceptual tool will allow us to consider how some cultures may have *gone bad* while others may *not* have, without naturalising or normalising their respective badness (or goodness). I conclude by considering how a sufficiently critical philosophy of culture might shake-up contemporary debates in environmental ethics.

### **Natural Resource Development and Social Histories in the Canadian North: A Comparison of the Yukon and Northwest Territories from the 19<sup>th</sup> Century to Present**

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Symbolic images of the Canadian North – pristine environments, abundant natural resources, and remote northern peoples – have pervaded Canadians’ cultural and political consciousness for over a century. This vision conveys Canada’s North as a homogeneous socioeconomic, political, and environmental landscape. Yet, a review of the social histories of Aboriginal peoples in the Yukon and Northwest Territories (NWT) reveals that peoples’ experiences with natural resource development, in particular, have been quite diverse. For instance, the Yukon’s volatile and heavily subsidized mining industry contrasts with NWT’s robust diamond mining industry and expanding oil and gas sector in scale, sustainability, and financial return; this results in different employment conditions, demographic compositions, and levels of cultural practice. Furthermore, literature suggests that the “adaptive potential” of Aboriginal communities toward resource development is not only a function of social histories, but of peoples’ perceptions and aspirations toward proposed resource projects. This presentation advances the argument that the Yukon and the NWT each possess unique social histories with respect to resource development; thus, each territorial context needs to be considered separately when projecting the future impacts of resource extraction activities and making subsequent policy decisions. In making our argument, we present a historical overview of the Yukon and NWT’s experiences with resource development, highlight the social learning which has taken place, and describe the distinct social landscapes which have evolved.

#### **Uncertainty about Causes and Effects of Global Warming in U.S. News Coverage Before and After Bali**

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Media coverage of environmental issues has been discussed by journalists, sociologists, and geographers. Some researchers have documented trends in the volume of coverage; others have examined types of sources. A troubling issue in U.S. news discourse is that human activity causing global warming continued to be presented as controversial even after the scientific community’s consensus was reflected in other countries’ media (e.g. Boykoff 2007). This paper investigates verbs of reporting and other linguistic elements as an indicator of the degree of certainty expressed regarding propositions about global warming. For example, (1) expresses more certainty than (2) does:

1. *Hundreds more people will die each year, according to a Stanford University study.*
2. *Researchers believe that hundreds more people could die each year.*

The Access World News database was used to retrieve the first ten articles on global warming published in U.S. newspapers during four periods of interest. The level of certainty in references to the causes and effects of global warming increased over time. More than half of the propositions in the 2005 articles were introduced with reporting verbs such as *say* or *believe*, which do not commit the reporter to the truth of the proposition:

3. *The human toll is unjust, striking hardest in countries emitting the least greenhouse gases that contribute to global warming, says the report in today's journal Nature.*

While these *say*-type verbs were still the most frequent strategy in the later periods, they gave way to less neutral reporting verbs such as *determine* or *discover*. Furthermore, compared with 2005 coverage, news stories published after the UN Climate Change Conference in December of 2007 had nearly twice as many propositions presented as factual statements, with no reporting verb:

4. *California bears the brunt of climate change in terms of air pollution health problems.*

#### **Legislating the Inevitable: Adaptation as a New Paradigm for Climate Change Governance**

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This paper starts from the assumption that climate change is ineluctable and therefore adaptation is inevitable. It examines the role that law can play in the adaptation of the agricultural industry to climate change. Our central thesis advances that an adequate legal framework for optimal adaptation shall integrate an adaptive structure based on flexible legislation and decentralized governance. First, given the unpredictability of climate changes, we argue that related legislation must integrate mechanisms designed to address unforeseen situations. The use of adaptive features such as signposts and thresholds may allow legislation to intrinsically adapt without requiring a formal and costly amending process. Second, we propose that policy makers shall favour a multi-stakeholder approach to governance in order to gather relevant information from appropriate groups and enhance levels of compliance.

### **“Ethanol the Savior of Rural America”**

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As world population numbers increase the demand for new sources of energy takes a global precedence. However, this energy must be essentially “green” because rising pollution levels place the world in precarious balance between environmental sustainability and environmental catastrophe. One new source of energy can be found in the production of ethyl alcohol by using fermentable waste products.

Modern agricultural management relies on concentration of domesticated animals for milk, eggs, and meat production. These operations are referred to as Confined Animal Feed Operations (CAFOs). Waste management is expensive and problematic in terms of handling waste to avoid surface and ground water pollution, odor issues, and air pollution. A typical central Texas milk producer with 3,000 head of cattle will typically spend in excess of \$35,000 (US) /month on waste management. The operation will generate over 150 US tons/ day of waste. Land application has resulted in surpassing the agronomic limit for nitrogen and phosphorus on the land thereby creating nutrient runoff. The runoff has created eutrophication issues and is a concern for water borne microbial contaminants.

This is a litigious area and many producers are faced with losing their operating permits or water, the inability to increase the size of their operations, and/or air, and nuisance lawsuits related to the wastes. CAFOs initiate a tremendous amount of litigation because waste overflows cause tremendous amounts of environmental damage. By converting this waste stream numerous point source pollution dilemmas will be eliminated thereby saving farmer’s revenue and future legal confrontations. A proprietary process has recently been developed to transform CAFO waste (dairy, hog, chicken, and turkey) into fermentable sugars that are subsequently fermented into ethyl alcohol or a range of other fermentation products. This strategy successfully reduces waste loading, avoids a large management cost for producers, and provides a value-add product for the agricultural entity. Fuel ethanol in the US sells for around \$2.50 (US)/gallon. Production cost of the fuel from waste is circa \$0.91(US) / gallon. The process has also been advantageous for certain types of industrial waste streams. The management system is designed to be constructed in rural areas, which typically have the greatest need for employment.

### **Development of Advanced Analytical Techniques for Monitoring of Emerging Pollutants in Water**

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Water is essential for life. Many human activities are causing water pollution problems. In recent years, growth in pharmaceutical industry and increasing use of drugs such as antibiotics in food production such as poultry and

fishery have resulted in increasing concern of the environmental impact of such chemicals. Pharmaceuticals comprise of approximately 3000 different compounds classified according to their functions, such as lipid regulators, antibiotics, analgesics and anti-inflammatories. The existence of some of these drugs in the aquatic environment have been detected even decades ago. Researches have indicated that the sources for their presence in water mainly resulted from the improper disposal of pharmaceutical products and waste from manufacturing plants as well as excreta from both human and animals. These pharmaceuticals may be released to the nature directly via sewage effluent outfalls or enter the groundwater system via surface runoff and leaching. They are considered to be environmental contaminants because of their high lipophilicity and low biodegradability. Although not yet evaluated adequately, the bioactive properties of pharmaceuticals might lead to adverse effect on human beings and ecosystems. These effects might include endocrine disrupting activities and the strengthening of the bacterial resistance exposed to subtherapeutic concentrations of antibiotics. Hence, highly sensitive and accurate analysis technique, such as capillary electrophoresis (CE) is essential to monitor the presence and the concentration of pharmaceutical compounds in the environment. In this study, we focus on the development of new instrumentation for water quality monitoring helps to achieve better use of scarce water resources, thereby increasing the availability of water and increasing land value.

### **Ecological Grief: An Inquiry**

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*“For one species to mourn the death of another is a new thing under the sun.” Aldo Leopold*

More people are feeling an unnamed sense of loss and grief over the loss of species and deterioration of the environment as well as a mounting anxiety about what the future holds for us and our children. This paper will discuss its findings regarding the emergence of ecological grief as a response to the environmental crisis and its differential impacts on children, adolescents, and adults. By drawing on the testimony and observations of educators (Thomashow), environmental writers (McKibben), and scientists (Wilson), this paper will provide an inquiry into the dynamics of ecological grief by proposing a typology of its different elements, including the experience of ecological disorientation and disequilibrium as the destabilization of climate patterns accelerate, and an increase in the occurrence of environmental and disaster trauma.

Others testify to their experience of tertiary guilt and shame regarding past environmentally dysfunctional behaviours, and their sense of powerlessness and environmental despair with respect to effecting change for societal sustainability. Still others describe their fear and anticipatory grief with respect to the future survival prospects of succeeding generations. Related cognitive responses that further complicate developing decisive responses to ecological problems include Environmental Generational Amnesia (Kahn), where the perceptual “benchmarks” of environmental health and pollution are declining from generation to generation. Conceptual resources that might illuminate the nature of ecological grief will also be discussed, such as ecological dissociation and the dysfunction of biophilia (Wilson), the innate tendency to affiliate with other species. This paper concludes that resources need to be identified to assist individuals to develop a sense of empowerment, suggesting that ecological grief can paradoxically offer a foundation for deepening ecological literacy and environmental citizenship.

### **Global Warming as a Moral Issue: The Ethics and Economics of Reducing Carbon Emissions**

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*“The stationary [non-growth, economic] state would make fewer demands on our environmental resources, but much greater demands on our moral resources.” Herman Daly, economist*

This paper will advocate that global warming needs to be perceived first and foremost as a moral issue, and that an ethical lens is critical for responding to the global economic and political challenges of reducing carbon emissions. After reviewing the troubling connections between ecological decline and violent conflict, this paper will explore the likelihood of the collision of global warming and global justice, and how it may be seized as an opportunity for integrating international environmental politics and global justice.

The centre of the dilemma as an ethical crossroads lies in the trend of the commodification of the atmospheric commons as private property, and the challenge of an alternative position of treating the atmosphere as a public good and part of the larger environmental commons. This paper will propose that uniting social justice and environmental sustainability is the most ethical way of moving forward as a human community on a warming planet, and will review the key principles of global environmental politics and the features of a “deep economy” centered on social and economic development as if the Earth mattered.

Finally, this paper will discuss the responsibility and the opportunity of integrating global justice with the intentions of sustainable development that lie behind the CDM (Clean Development Mechanism) of the Kyoto Accord and more recent global initiatives. Rather than abdicating the social responsibility for reducing the human carbon footprint to the autonomous and amoral workings of the market economy, this paper will propose that global warming needs to be framed primarily as a moral issue, and that our global responses need to be the expression of a collective ethical imperative of justice and sustainability.

### **The Case for Contingent Valuation in Valuing Environmental Assets/Services in Cost-Benefit Analysis: A Review**

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Within the Environmental Impact Assessment process, the key economic component is that of cost-benefit analysis. This requires the identification – and, crucially, the monetary valuation – of all environmental costs and benefits associated with a proposed or existing project in order to assess whether the project is viable from a purely economic perspective. It is readily accepted that economic viability is only one criterion for acceptance of a project, but it is generally agreed that it does allow for more informed decision-making. The valuation of environmental costs and benefits is a highly contentious issue: there are those who insist that nature is beyond price, while others point out that many environmental assets/services are not market-related and are therefore extremely difficult to value. Further, the point has been made that even in the case of those environmental assets/services which are market-related, prevailing market prices reflect market value and often do not capture ‘total economic value’ – that is, both use value and non-use value. Against this background, the purpose of this paper is to examine the contingent valuation method. Although this method has been rejected by many on the ground that it is a ‘subjective’ valuation technique and therefore lacks the precision and reliability of market-based (or ‘objective’) valuation techniques, it will be argued that, notwithstanding the reservations surrounding this particular valuation technique, the contingent valuation method is the *only* valuation technique that can capture ‘total economic value’ and, that, with the right approach, the contingent valuation method can yield acceptably accurate and reliable results. Case-study evidence will be used to demonstrate the practical application of the contingent valuation method.

### **Re-Evaluating Refugee Rights in an Age of Global Warming**

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Resulting from climate change and the escalating severity of climatic events such as hurricanes, draughts, or tsunamis, we have seen an increasing number of environmentally-displaced persons worldwide. In fact, estimates have shown that their numbers have surpassed those who are officially recognized by the United Nations High Commission on Refugees. In the future this influx in ‘environmental refugees’ – who neither willingly left their country, nor have hopes for return – will pose growing challenges to Canadian immigration and integration policies.

My work builds upon the current theoretical foundations of international human rights and multiculturalism, and tie existing theoretical assertions to ‘real-world’ environmental and immigration policies in Canada. It seeks first to demonstrate that that UNHCR definition of ‘refugee’ poses significant challenges for people who have been displaced by environmentally-related disasters, as it does not afford them the right to be officially recognized as “refugees” and indirectly excludes them from the possibility of claiming the rights and privileges associated with official recognition (for example, a right of entry into a state). Drawing from an extensive body of theoretical work on international human rights, my paper examines the potential for environmentally-displaced persons to receive official recognition as “refugees” along with its associated rights and privileges. Furthermore, it demonstrates how not recognizing their status is both theoretically and practically unviable given the shifting volatility of our global climate and the inevitability of their forced migration by drawing on the fallout effects from Hurricane Katrina in New Orleans.

Ultimately, my paper is premised on the idea that while environmental refugees may provide a unique challenge in the areas of political theory and public policy, this should not limit their claims to justice. It seeks to develop a policy-minded, theoretical framework designed to ensure that it does not.

**Human Impacts on the Environment as a Cause of Natural Disaster –  
Approaching Disaster from a Sustainable Development Perspective**

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In this article, it is argued that resource degradation can be a crucial factor in determining the impact of natural hazards. Hurricane Katrina and the Asian Tsunami serve as examples that show how faulty resource management contributes to natural disaster. In connection with a better understanding of environmental protection capacities, future natural disasters could be handled more efficiently. Other anthropogenic variables like social inequality or poverty also need to be included in disaster mitigation programs. Considering all these factors, leads to the conclusion that only a holistic approach like sustainable development can be successful in disaster reduction.

***Urbanization in Ghana:***

***A Call for an Establishment for Research-Based Planning and Management of Metropolitan Areas***

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*The key problem is that the urban population is growing very fast while economic growth and the development transformations necessary to support it and enhance the quality of urban life are not occurring as rapidly. To date, there is no single urban research centre in the country whose faculty probe the problems and opportunities confronting our cities and towns. Between 1960 and 2000, Ghana, population grew at the rate of 2.7 percent per annum, suggesting a doubling time of about 26 years of the current population. At the regional level, Greater Accra Region (4.4 percent per annum, implying a doubling time of 16 years), followed by Ashanti Region (3.4 percent per annum, implying a doubling time of 21 years) and Western Region (3.2 percent per annum, implying a doubling time of 22 years) have the highest population growth rates in the country. There has been a sustained urban growth in Ghana over the period. In 1960, about 23 percent of the population lived in urban areas. The figure rose to 29 percent in 1970, 32 percent in 1984; and 44 percent in 2000. It is conceded that the establishment of a Centre for Urban Studies is not the panacea to Ghana’s urbanization problems, however given the changing landscape the country is currently witnessing, it undoubtedly should serve as a rallying point to mobilize the expertise of the universities, the institutions of architects, engineers, scientists, planners, etc. to bring rationality into the*

*management of our cities. The Centre for Urban Studies, if established, will collaborate with institutions and organizations to combine their substantive expertise with the methodological skills of Centre staff. It will also work closely with community organizations and local governments to answer key questions about the metropolitan areas and about policy or organizational issues.*

### **Indigenous Knowledge and Environmental Ethics: From Guidelines to Governance**

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Indigenous peoples all over the world have called for the incorporation of Indigenous traditional knowledge (TK) in the decision-making processes that impact their lives, lands and waters. The predominant form or response to this need, both in Canada and internationally, has been to develop guidelines for the incorporation of TK in environmental and resource management. This approach has been taken by many non-Indigenous proponents of development; including governments, industries and research-oriented institutions such as universities. The fundamental shortcoming of the vast majority of such guidelines produced to date is that they tend to serve the needs of the developer rather than those of the Indigenous groups from whom the TK is derived. In many cases, therefore, the guidelines fail to protect shared TK from exploitation and misuse. As a response, many Indigenous groups have developed their own guidelines based on their own worldviews, traditions, values and knowledge systems. Despite such efforts and the overall increasing attempts to incorporate TK into decision-making, there remains widespread dissatisfaction with current processes aimed at doing so. This paper explores the current policy and legislative context for addressing TK in Canada and evaluates key TK guidelines from a variety of development proponents and Indigenous groups. It also considers in general terms the gap between TK incorporation guidelines produced by non-Indigenous proponents of development and those created by Indigenous groups themselves. Areas of convergence and contention between these two sets of guidelines are highlighted. A new model for the ethical and respectful incorporation of TK into environmental and resource management decisions, based on the words of Elders and TK holders, is proposed. An example from Ontario is described which foretells a paradigm shift in addressing TK application in Canada.

### **Combating Climate Change Through Trade Mechanisms: Weighing Options Ahead of the Post 2012 Commitment Period**

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One of the most talked about sustainability concerns facing the earth's current inhabitants is the issue of climate change. With emerging signs of temperature change, it is now widely accepted that climate change is real, that human emissions of green house gases are a cause; that if left unchecked, climate change may lead to extreme weather events; that it may threaten food security and that it may lead to ill health and an unprecedented level of global economic decline. Realizing this, the world community came together under the United Nations Framework Convention on Climate Change (UNFCCC) to build a roadmap which addresses this concern. This roadmap led to the Kyoto Protocol of 1997 which advocates taking concrete steps and binding commitments to reduce greenhouse gasses (GHG) that contribute to global warming. Industrialized countries that are parties to the Protocol, have committed themselves to an aggregated reduction of CO<sub>2</sub> emissions to 5% below 1990 levels. To achieve these, industrialized countries will have to implement measures to reduce GHG emissions according to their pre-defined country commitment levels. To support the industrialized countries in achieving this, the Kyoto protocol offers a release valve by providing three flexible mechanisms through which they can achieve their emission reduction target with so much flexibility and suppleness. These three mechanisms which enable countries to pay for emission reductions anywhere on the planet, based on the idea that climate change is a global problem, and that its reductions are equally good for the climate no matter where they occur, are the Clean Development Mechanism (CDM), Emission Trading (ET) and Joint Implementation (JI). These mechanisms allow the trading of emission reductions between nations as alternatives to domestic action and an opportunity for them to supplement domestic actions with

reductions outside their own jurisdictions. However, as laudable as these mechanisms may seem, events surrounding their implementation have continued to show that these mechanisms may not provide long term solutions to the struggle against climate change, and that they may only lead to short term results. It has been argued that addressing climate change concerns require long term measures and policies which produce sustained and continuous reduction of green house gases and that the idea of identifying the lowest cost measures to meet the targets embraced by the protocol will only produce short term results. Scholars like Doelle have therefore argued that it is *only* through long term policy changes in urban planning, changes to transportation, and investment in conservation as well as shift to renewable sources of energy that the world can effectively tackle the menacing effects of global warming. How true is this?

This paper offers answers to this and many more questions on the effectiveness of the trade mechanisms in the Kyoto Protocol. It undertakes a comprehensive appraisal of the three flexible mechanisms built into the Kyoto Protocol with a view to analyzing their strengths and weaknesses in the struggle against climate change. The paper will provide answers to the questions: how effective have the flexible mechanisms of the Kyoto Protocol been in combating climate change? what are their long term and short term weaknesses? should these market based mechanisms be retained for the post 2012 commitment periods? If yes, what should be done to strengthen their effectiveness?

### **The Economic and Social Sustainability of Gated Communities**

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There has been an increase in every continent over the last two decades of residential estates secured behind walls and gates, often featuring private security, private roads rather than public highways, and private leisure facilities. This form of development has been the subject of much debate from a range of disciplines including law, geography, anthropology, economics, urban planning and sociology. The motivations of the key players for this form of development vary according to the context and the analysis varies according to the academic discipline. Property values are a key concern for residents in some places whereas in other areas the rise of crime and safety are a major driving force. The phenomena has been criticised as a force for reinforcing exclusivity and fear of the other which seems to be contrary to the planning aims of social inclusion widely adopted in Europe. Lawyers have analysed the rights and obligations of different parties from a socio-legal perspective and economists have suggested that residents can best be seen as purchasing a category of property known as club goods. This presentation will outline the key concerns emerging from this interdisciplinary debate and suggest which are issues for the economic and social sustainability of the developments.

### **Designing an Integrated Transdisciplinary Environmental Science Curriculum Using an IRMA Chart: An Example from Bethune-Cookman University**

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Designing an effective transdisciplinary Environmental Science/Studies curriculum that coherently conveys the range of approaches and topics available in the discipline is a significant challenge. Indeed, any one Environmental Science/Studies program arguably cannot cover the entire field or all possible perspectives, meaning that a program must cover the essentials even while the specific set of courses focuses on some subset of the Environmental Science/Studies discipline. One way to approach this challenge is to begin with an Introduce-Reinforce-Measure-Assess (IRMA) chart that identifies the essential core concepts (Student Learning Outcomes, SLOs) and goals of the university and the larger field of study, and then build courses outward from those outcomes and objectives based on the subset of the field desired. At Bethune-Cookman University (BCU), an IRMA approach is being utilized to develop a new B.S. degree program in transdisciplinary Environmental Science. Program development began from the foundation that, in addition to institutional SLOs, the programmatic SLOs to be introduced to majors were a

basic understanding of 1) the structure and function of ecological systems, 2) the structure and function of geochemical systems, 3) the structure and function of human systems, 4) the role and impacts of humans within these three types of systems as pertains to environmental concerns, and 5) the management and control of these impacts from an environmental perspective. All specific objectives of the program flowed from these five learning outcomes, and all courses in the program were categorized based on whether they introduce, reinforce, measure, and/or assess one or more of the specific objectives related to these learning outcomes. In this way, the program's course requirements are all shown to play a part in the program's ultimate goals, but the specific course topics direct the context in which those goals are accomplished into the subset of the Environmental Science/Studies discipline being emphasized (in the case of BCU, a focus on coastal environmental issues as they particularly pertain to water resources and land use). Other programs can use the IRMA approach to develop a set of courses with a different focus for the same, or for a different, set of learning outcomes. Indeed, the set of core learning outcomes in transdisciplinary Environmental Science/Studies is itself an important issue for academic discussion, and this presentation will be followed by a roundtable discussion of whether or not there is (or should be) a set of critical core concepts in Environmental Science/Studies from which all programs should be developed.

### **An Ethical Analysis of the Scientific Weight of Evidence Approach in the Regulation of Toxic Chemicals in Canada**

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The Canadian Chemicals Management Plan is designed to protect the environment and human health from harmful effects of toxic chemicals, in accordance with the Canadian Environmental Protection Act (CEPA). The Plan involves conducting risk assessments on the approximately 23,000 chemical substances in use in Canada and developing risk management plans for those substances found to be toxic. Section 76.1 of the Canadian Environmental Protection Act (CEPA) specifies that when Environment Canada and Health Canada are "conducting and interpreting the results of" risk assessments of chemicals that may prove to be toxic, they are to apply a "weight of evidence approach" and the precautionary principle. A great deal has been written about the meaning and application of the precautionary principle, but much less about the meaning and application of the scientific weight of evidence approach, especially its normative content. The concept raises both epistemological and ethical questions. This paper places the discussion of the scientific weight of evidence approach in the context of its use in Canada's Chemicals Management Plan, using the example of the recent widely-reported proposed banning of bisphenol-A in polycarbonate baby bottles; discusses possible meanings and ways of applying the scientific weight of evidence approach; and explores their implications for the adequacy, transparency and public accountability of the results of risk assessments and risk management plans, and the prevention of harm, which is the purpose of CEPA. It will be argued that current management plans for bisphenol-A are inadequate to protect the public, including future generations, against the potentially harmful effects of bisphenol-A.

### **At What Cost Tourism? Individuals Rights vs. Environmental Rights in 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 Argentina. Argentina has emphasized tourism as a way to help its economy recover from its 2001 economic collapse. In 2006, a record number of people (4,155,920) visited Argentina and the country is already set to break this record with 1,307,681 people having visited in the first quarter

of 2007. In short this is big business; tourists infused over \$3.25 billion U.S. into Argentina's economy in 2006. This increase in tourism in Argentina over the past 5 years is having an effect on the country's environment, its cities and its people. This study will discuss how the competing needs 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 city of Puerto Iguazú and the Iguazú National Park in Argentina and people who live near them. Finally, this study will discuss whether policies that encourage ecotourism and sustainable development can limit the effects of tourism on the Argentine environment.

### **Water and Ethics: Why a New Model for Resource Management is Needed**

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In the three decades following the 1977 UN Conference on Water in Mar del Plata, resource managers and policy makers concentrated primarily on improving water use efficiency through more effective rational planning. During this same time period, several experts and policy professionals began calling for a new "water ethic" in recognition of the normative judgments that lie at the foundation of water management and policy decisions. These judgments, it was presumed, delineate what management and policy measures are considered to be rational and therefore carry significant weight in determining appropriate courses of action. This paper investigates the normative judgments that underlie three prevalent water management paradigms and considers whether, once adopted, the rational decisions that follow from these judgments provide an adequate basis for a water ethic. The three management paradigms presented and assessed are: Integrated Water Resources Management, Adaptive Management and Soft Water Paths. Although each management approach recognizes certain ethical concerns all three ultimately fail to adequately address the moral obligations regarding water. The specific reasons that each paradigm fails vary, but all stem from the received model of natural resource management in which procedurally rational exercises are assumed to secure acceptable normative ends. I conclude the argument with suggestions regarding the relationship between judgment and rationality in water management paradigms and the search for a new ethic for water.

### **Tourism, Development, and Guaraní Communities in Argentina**

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In many countries, magnificent and remote ecological sites are often historically and presently bound to an indigenous culture or cultures. Although a tourist may travel to another country with the express intention of visiting an ecological wonder, that tourist will invariably have some type of interaction with a member of a local indigenous group. This tourist-indigenous interchange has the potential to leave an enduring effect on local indigenous communities once the tourist has departed. In Misiones Province, Argentina, many of the Mbya Guaraní ethnic people live in an area near the Cataratas del Iguazú that is being rapidly developed for tourist use. One consequence is that the Mbya economy is shifting from established agroforestry practices to tourism. While this change has brought needed income to some indigenous communities, there have been concurrent changes in culture and physical and psychological health. Although the tourist-indigenous interchange can afford cultural growth and mutual respect, when the need for tourist money is the driving force of the interaction, it can lead to destruction of the indigenous culture. Therefore federal, provincial, and local government programs of sustainable tourism must include indigenous communities as economic partners in environmental and developmental plans, a practice that has been seldom followed in the case of the Mbya. Furthermore, programs of sustainable tourism with poorly educated indigenous groups must be based upon a mutual respect between tourist and indigenous host, where programs for educating tourists about indigenous history and culture become the primary component of the exchange, and the exchange of money for services and goods takes on a reduced importance.

## **Food Security and the Doomsday Vault: A Death Grip on a Fallacious Paradigm**

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In 2008, the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) initiated its Global Seed Vault in Svalbard, Norway, an ex situ collection of the world's domesticated food plants for conservation and research purposes. This multi-national initiative, under the direction of the UN Food and Agriculture Organization, is an insurance policy against the erosion of the inventory of domesticated crops due to disuse and more catastrophic threats to food production due to disease, climate change, or social conflict. This paper examines ITPBRFA documents in the context of shifts in agriculture over the last half decade: the globalization of food production systems; patenting of seeds under national and WTO intellectual property rights law; and continuous erosion of the genetic base for food production. This analysis supports the conclusion that the programs being implemented by the ITPGRFA are not an avenue to food security.

First, the focus of ITPBRFA is on creating a comprehensive ex situ collection of the seeds of domesticated plants. Access to this collection will be far easier for corporations and the national governments of developed states than for small farmers in less developed regions, whose seeds will be over-represented in this collection; in this "bank", deposits are universal but withdrawals, as a practical matter, privileged. Second, while the treaty mandates free exchange of its plant collection and subsequent genetic modifications based on these holdings, it subordinates the second tier of access to nationally-based systems of plant patenting. In addition, use of the collection that results in commercialized pharmaceutical products remains outside of the scope of the treaty, including its provisions calling for the sharing of benefits with third world farmers. At this point in genetic engineering, it is not practical to anticipate where the food use of crops will remain separated from nonfood uses; significant exploitation of this loophole can be anticipated. Third, while the Treaty's objectives include the promotion of crop diversity in situ, especially in regions of exceptional biological diversity where most of the world's food crops have been domesticated, it envisions such crop conservation and research taking the form of partnerships among small farmers, developed nations, and private parties. Put another way, what looks to be the promotion of in situ crop diversity becomes an avenue of access to such localities by the governments and corporations in the more developed regions. In sum, the treaty is an efficient transfer mechanism by which the efforts of small farmers over multi-millennia are harvested by the dominant corporations and government agencies of the world. Rather than offering a critique of the industrial agricultural practices and seed patenting that have eroded crop diversity, ITPBRFA offers a further subsidy to the project of shifting plant innovation and its benefits from the small farmer to the corporate laboratory.

## **Identifying Ecological Units of Conservation for Polar Bears in Canada**

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Long-term changes in arctic climate and sea ice have affected the body condition, reproduction, life-history, and abundance of polar bears (*Ursus maritimus*). However, these environmental and biological patterns have not been spatially uniform. Furthermore, genetic interchange between groups of polar bears may be influenced by ecological and geographic features so that patterns of biodiversity may develop within the species. Fortunately, the Canadian Species at Risk Act allows intraspecific units of biodiversity to be afforded legal protection. These so-called "designatable units" are identified through a hierarchical consideration of taxonomy, genetic distinctiveness, range separation, and biogeographic differences. We applied this framework to polar bears and identified 5 groups that

warrant separate consideration under the Species at Risk Act. Bears in the Hudson Bay Designatable Unit are experiencing declines in body condition, survival and abundance as a consequence of reductions in sea ice. Similar indicators of decline have been observed in the Beaufort Sea Unit. In contrast, polar bears in the Davis Strait Unit may be stable despite sea ice declines, possibly due to the abundance of harp seals (*Pagophilus groenlandicus*) available as prey. Bears in the Central Arctic Unit may be negatively impacted if sea ice declines continue as forecast, whereas bears in the High Arctic Unit may be buffered by a combination of extreme latitude and oceanographic currents that maintain extensive areas of sea ice. Affording separate protection to these 5 units would provide a more effective and robust basis for the conservation and management of polar bears. Although these findings were made available to COSEWIC for inclusion in their 2008 Assessment Report, COEWIC assigned polar bears a single designation of “Special Concern”. This designation contradicts the findings of the IUCN and the U.S. Fish and Wildlife Service and fails to adequately represent the large-scale threats facing polar bears in Canada.

### **The Living Museum under Ecological Stress, Case Study of Yala Swamp Beyond 2020-KENYA**

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Yala Swamp lies within the equatorial line (zero degrees) with rich biodiversity and has coverage of 175km<sup>2</sup>. Research findings in relations to property rights management, environmental stewardship and healthy ecosystems from case studies of Yala Swamp in Kenya are discussed. Yala Swamp is home and living museum to many fish species. This fact is supported by reality that prior to the introduction of Nile perch in Lake Victoria for export market, the lake was once dominated by over 300 fish species and currently, Lake Victoria only supports three fisheries. The endemic species that were in Lake Victoria, it is only evident that Yala Swamp has lived to its restoration of native species which cannot be found anywhere within the catchments of Lake Victoria. Currently the Swamp has been leased to an American Dominion Farm investor for the purpose of agricultural production without considering the dire consequences. Within the project, a number of communities have been forced to sell their lands and homes for project takings to which conflict of interest has created a vacuum of land rights and ownership and the State involvement in leasing lands to foreign based developers without conducting EIA and the socio-economics of wetland reclamation. The integrity of the Wetland has been threatened and closing its death bed, a fact that many have never realized just like the case with introduction of Nile Perch (*Lates niloticus*) in Lake Victoria to prey on the lucrative native fisheries. The irony in this scenario is the issue of political involvement by policy makers, through murky deals, leaving behind a nightmare on a natural habitat. The paper will explore the concepts of community participation in managing natural habitat and explore further the impact of Free and open Trade Policy and consequences of climate change. The study further gives an account of inventory and future potential loss of biological diversity on a property right. In summary, the paper will entail the missing research links and gaps and possible recommendation to restore its glory, food security, environmental legislation, policy and analysis, and a projection of the Wetland life beyond 2020. Also of importance are the satellite lakes within and their rich biodiversity to the entire national heritage of such an ecosystem.

### ***Ateliers: Creative Transdisciplinary Approach to Environmental Problem Solving***

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*Aroused environmental challenges demand understanding a synergetic nature of environmental problems and integrating society and academia knowledge for solving these persistent problems. Indeed, education and training are main driving forces of a society's mentality reshaping. But it is not enough just to address environmental issues in a curriculum. Skills and competences for dealing with highly complex and ill-defined problems have to be developed in order to effectively cope with sustainability challenge. University education is expected to generate relevant didactic forms to intensify a polylogue and mutual learning from each other across all stakeholders to tackle sustainability puzzles.*

*Transdisciplinary approach seems to be the best didactic form to combine extending knowledge, developing relevant competences and building community's capacity in the field of environmental problems solving. Atelier as a specific form of transdisciplinary case studies occupies a fitting place in this variety of educational eco-innovations. Pioneered by the Gund Institute for Ecological Economics (University of Vermont) this practice was continued by the Institute of Ecological Economics (Ukrainian National Forestry University) in the international atelier "Ecological Economics and Sustainable Forest Management in the Ukrainian Carpathian", which took place last fall. Nowadays Ukraine transforms own economic system and in the mainstream of these much-needed changes are questions of building a proper property system to enhance natural capital of the country and to avoid strong emphasis on harvesting structure of ecosystems, the first of all forest ones. Atelier was aimed in these problems exploration, its program involved conference, field trip, discussions with stakeholders and intensive teamwork.*

*Ateliers result in a variety of educational, scientific and social benefits; they blend academic lecturing, problem-based learning and internet-based education, put student into a real world of problem investigation, stakeholders' preferences identification and capacity-building methodology development, they bring to each participant feeling of own responsibility for environmentally-sound development.*

### **Lead Pollution in Air Studied by Nuclear Analysis Techniques**

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As is well known, lead is highly toxic element and its minute amount in the body will have severe physiological or neurological effects, in particular for children. Ten years ago the largest source of anthropogenic Pb in air was derived from the combustion of leaded petrol, e.g. exhausted from vehicles. After phasing out of leaded gasoline we found that lead concentration in Shanghai is still high, average Pb concentration in PM<sub>10</sub> (aerodynamic diameter < 10 μm) is 245 ng/m<sup>3</sup> in 2003, above the value of 200 ng/m<sup>3</sup> recommended by WHO, dropped around 50 percent since stopped the use of the tetraethyl lead in gasoline in 1997. Therefore we must still pay much attention on reducing its pollution. First of all, we have to find which exhausted source is the dominant lead pollution source now, and then take a measure to control it. Here we used nuclear analysis techniques, such as PIXE (particle-induced X-ray emission) and micro-PIXE, XAFS (X-ray absorption fine structures) and lead isotope ratio, combined with ICP-MS (inductively coupled plasma-mass spectrometry) to investigate aerosol particle size and shape, elemental distribution in single particle, Pb concentrations of PM<sub>10</sub> and PM<sub>2.5</sub> and its chemical species. Besides, source apportionment of the atmospheric lead was calculated with a combined method of lead isotope ratios and lead mass balance, along with μ-PIXE analysis of single particles and pattern recognition of the spectra. It was found that major origins of the lead in PM<sub>10</sub> of Shanghai were lead free automobile exhaust, metallurgic dusts, coal combustion. The later one dominates the lead pollution in air, around 50%, that was further proved by soil lead measurement nearby coal-fired power station. Probably it is the same situation in other large cities where the structure of energy supply is mainly based on coal-combustion in developing countries. Moreover the blood levels were determined from children less than 6 years old and lead concentration in total suspended particles (TSP) in 1991-2006 with an age less than 6 years old using an epidemiological protocol we found that the blood lead level of children strongly correlates with the lead concentration in atmospheric particles, and the later correlates with the coal consumption instead of leaded gasoline after phasing out of leaded gasoline. We suggest that ones should pay attention to deleadization along with desulphurization in order to further reduce the lead pollution in air.

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### **3. CONTRIBUTED POSTER PRESENTATIONS (\*Presenter/Contact)**

***Alphabetical by Indicated Presenter***

### **Energy Crises in Baghdad**

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A bulging rapid population growth makes increasing demands on finite resources including energy, fresh water and living spaces which requires energy and water conservation program. The residential energy consumption survey includes most housing units occupied in the selected six regions in Baghdad, which was estimated to be 515 houses and 8753 households. Local daily, monthly and yearly measurements for solar energy, air temperature and relative humidity were carried out. Electrical energy and fuel consumption during 2000, 2002 and 2005 for three quantitative samples of (communities, families and persons) were recorded. The effective parameters that influence the consumption such as (climate, characteristic of population, heating and cooling technique, an economic and psychological status of customer) were investigated. In addition, per capita energy consumption and carbon dioxide emissions and distribution of energy production, consumption for different sectors in Baghdad were indicated and the cooling and heating degree days were evaluated. Major conclusions indicated that

1. Baghdad accounts for about 40 % of Iraq's total power load and Baghdadi power demand is increasing as people buy new air conditioners and other electrical appliances
2. The shortage of electric generating capacity in Baghdad in 2005 was 82%-86% and the situation could become disastrous
3. Since the great percentage of energy consumed was for heating and cooling the buildings, the passive heating and cooling systems are essential to apply in Baghdadi buildings

### **Water Tribulation 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 the 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. During the first Gulf War, Allied bombings targeted eight multi-purpose dams which wrecked flood control, municipal and industrial water storage, irrigation and hydroelectric power. Four of seven major pumping stations were destroyed, as were 31 municipal water and sewage facilities (20 in Baghdad) resulting in sewage pouring into the Tigris. Tigris River water is a concentrated cocktail of pesticides, fertilizers, sewage water with oil, gasoline and heavy metals. Adding to the hazards, very few sewage treatment plants in Baghdad are operational. Wastes from factories, hospital, garbage and most of raw waste from the city of six million residents can be pumped through the sewer system, completely bypassing any treatment, and flow right into the river.

Eight stations for monitoring and samples collection were chosen in different positions on the Tigris River and various analyses were carried out. Samples were prepared as two types. Type one included inorganic compounds / poisonous and heavy elements, organic compounds, radiated materials and herbicides and insecticides. Type two included: bacteriological tests, physical and chemical tests (COD, Turbidity, Color, pH, Electrical Conductivity, Magnesium, Calcium, Bicarbonate, Sodium, Potassium, Iron, Sulfates, Chlorides, completely soluble materials, completely suspended materials, Nitrogenous compounds, Phosphate, Fluorides). The major conclusions are

- 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
- Baghdad's Water demand is estimated to 3.2 Millions m<sup>3</sup>/day, the quantity of produced water is (66%) of the required needs

- The water analyses during 2003-2005 covering eight stations on the Tigris river showed that the concentration of organic matter, oil and grease, heavy metal, coliforms and fecal coliforms are strongly different from one station to another and are higher than permissible

**The Greening of the Northern Great Plains:  
A Case Study in Municipal Sustainability Planning in Grand Forks, ND**

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The Green3 Grand Forks initiative is a plan prompted by concerned citizens and endorsed by Mayor Brown of Grand Forks, North Dakota in 2007. By signing this initiative, Grand Forks fulfills the Mayor's Climate Protection Agreement, an accord dedicated to meeting the goals of the Kyoto Protocol in individual US cities. To carry out this plan, a resource committee comprised of community collaborators with diverse backgrounds was formed. The Green Grand Forks Plan focuses on three main components: improving environment health, increasing efficiency and saving money through lowering carbon dioxide emissions, increasing energy efficiency and lowering costs to local taxpayers. The city has established a twelve point plan to achieve these goals, encompassing both long-term and short-term mitigation strategies. An analysis of this initiative shows that as with any environmental action, certain obstacles are to be expected. While there is support behind this initiative, there has been reticence expressed by community sectors and local decision-makers. One approach to address such attitudes is public education and outreach on issues of sustainability. While environmental issues occur at a global scale, specific concerns need to be addressed at the local level. The Northern Great Plains is unique in climate and landscape therefore offering distinct opportunities for innovative solutions. The Green3 Grand Forks initiative places Grand Forks at the helm of the sustainability movement in the Upper Midwest and serves as a model for similar cities in the region.

**Student vs. Professor Accreditation of the McGill School of Environment –  
A Model for Assessing the Quality of Undergraduate Environmental Education**

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This project is a model of the value of internal evaluation for assessing the quality of undergraduate environmental education programs. It is the result of a 4 month undergraduate independent study comparing student and professor perceptions of the quality of education at the McGill School of Environment (MSE). The research consists of an online survey of MSE students and interviews with MSE professors. The results provide three things:

1. An improved understanding of the goals of MSE students and professors and how well they feel they are achieving these goals through the MSE.
2. A comparison between student and professor perceptions of the quality of education at the school.
3. Suggestions for program improvement.

The research component of the project includes the online survey, personal interviews, and a literature review of other Canadian programs. The online survey was designed to determine how motivated and inspired students feel about their program and gather suggestions. Students wishing to participate in a follow-up interview were met in person for 30 - 60 minutes. The interview questionnaire for MSE professors was designed to determine professors' ideals regarding environmental education and how well they feel they are able to achieve these ideals within the MSE. Professors were recruited for interviews on a voluntary basis via email and were met in person for 30 - 60 minutes. The analysis component involved the tabulation of survey and interview results to determine the frequency of similar responses to questions. The results of each survey and interview question were graphed, and professor and student responses were then compared side by side in separate graphs. Recommendations for improvement were prioritized according to feasibility.

This project demonstrates that both MSE students and professors have similar opinions about environmental education and similar priorities for program improvement. Response rates were 55% for the student survey (n =

176), and 48% (n = 11) for the professor interviews. Students' top reason for choosing the MSE was because they were passionate about environmental issues (32%) and that students' top goal is to achieve a broad interdisciplinary education (36%). The majority of respondents feel inspired (56%) and challenged (66%) by their programs. However, less than the majority (45%) feel that their program has given them ideas about job opportunities and how to pursue them. A strong sense of community is also lacking in the MSE, with only 38% of respondents saying that they feel part of a community in the MSE. Despite these weaknesses, 66% of students describe themselves as satisfied with their program.

MSE professors feel the top goals of environmental education are to teach independent learning and critical thinking skills (36%) and to give students a deep enough understanding of environmental issues to make effective change in society (27%). 73% of professors believe that an environmental undergraduate degree ought to have a greater focus on interdisciplinarity than other degrees. 27% believe in various main goals that are shared with other degrees. Professors feel the most important skills to be learned in an environment degree are the ability to listen well and empathize with different points of view (25%), independent research skills (25%), and the ability to communicate across disciplines (25%). The overwhelming majority (89%) support small classes over larger classes, and 63% support more team teaching than individual teaching.

This project demonstrates the value of self-accreditation for undergraduate environmental programs. This model assessed and compared student and professor perceptions of the quality of environmental education at the MSE. It found that MSE students and professors have similar opinions regarding environmental education and similar suggestions for improving the quality of the MSE's undergraduate program. I recommend that this assessment be conducted annually in order to make the MSE as rewarding as possible for its students and professors.

### **Changing Subsistence Resources in the Yukon Flats Region of Alaska**

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A rapidly changing climate has repeatedly been shown to cause distinct and rapid changes in the environment as the system adapts to cope with the new stresses, including warmer temperatures, increased fires, less predictable weather, and invasive species. Many rural communities, especially in Alaska, are part of and dependent on the resilience of their ecosystem as an underpinning of their traditional subsistence lifestyle. Since the economics of many of these villages is one of intermittent work and little money, a system of mixed dependence on purchased goods and subsistence food resources has formed. In addition, many citizens in these villages report benefits of subsistence hunting such as cultural education of the youth and increased health. Under current climate predictions, villages in the Yukon Flats region, which depend mostly on moose for their subsistence diet and traditional ceremonies, will likely see their status change in the sharing network of the region in terms of meat resources. Some may benefit and find themselves more of a hub of the area, whereas others may lose that status. The ALFRESCO model of climate change shows most of the villages in the region will experience a two to three-fold increase in suitable moose habitat, but social factors decreasing the hunting regions associated with each area may balance that increase to hold yield constant. These social factors are driven by an increased need for infrastructure such as schools, gas stations, and stores. A spatial analysis using ArcGIS that incorporates the ALFRESCO model and these social factors was constructed incorporating traditional hunting areas as well as more recent river, road, and trail access. Moose habitat is expected to increase due to the increase in area recently burned, but this increase does not necessarily correlate to an increase in moose for food due to other increasing pressures, including increased predation both by bears and humans. This increase is also balanced by the predicted decrease in other subsistence resources such as salmon, berries, and caribou. The spatial model created may in the future be expanded to include more parameters and more types of resources to create a broader picture of the status of subsistence living in the Yukon Flats.

### **A Study on Localized Module of Dust-Fall Numerical Model**

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Detachment and transport of soil due to the natural force of wind is a major environmental problem in many parts of the world. In Taiwan, because geography and recent typhoons caused landslide-mud on many watersheds, soil erosion by wind is a serious consequence of riverbed. Also, as population density ranks second in the world, natural and anthropogenic sources of dust emissions are both important. There is little research covering both these sources in detail. This needs a dynamic emission module to delicately assess the amount of emitted dust loads and the inference of air quality from these sources. It is our goal to combine this research to create a three-dimensional grid dust-fall model. To develop this model, according to the related research, we have set up the module of wind erosion from natural sources and the emissions of paved roads. However, the simulated result is much lower than the observed one. Thus, the objective of this paper is to improve the module built from foreign reference and to establish a localized one that is suitable in Taiwan.

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Dr. Kimberly D. S. Reiter  
Conference Chair