



Program and Abstracts

THE 16TH INTERNATIONAL INTERDISCIPLINARY
CONFERENCE ON THE ENVIRONMENT

September 22-25, 2010

Tucson, Arizona, USA

*Organized By
The Interdisciplinary Environmental Association*

PRESIDENT'S WELCOME

Dear Participant:

On behalf of the Interdisciplinary Environmental Association, I would like to welcome you to Tucson, Arizona and the 16th International Interdisciplinary Conference on the Environment. In 1984, the global human population hovered around 4.8 billion. The opening of the Montreal Protocol for signatures was still three years off. UNCED, the Rio Conference on the Environment, with its groundbreaking agreements on climate change, biodiversity, forests and the global agenda wouldn't take place until 1992. Key laws in the United States for environmental protection such as the Clean Water Act, the Clean Air Act and the Resource Conservation and Recovery Act were only a decade old. And Al Gore was still a U.S. Representative from Tennessee and not a Nobel Peace Prize, Oscar, Emmy and Webby award winner and Time Magazine's Person of the Year! Much has changed in the study of the environment, but at least one thing has held constant: the IICE!

Throughout all of the last 16 years, interdisciplinary environmental scholars of all stripes from the four corners of the Earth have known that the International Interdisciplinary Conference on the Environment was the best place to present cutting edge work on the Environment. This year's conference bears much in common with those earlier meetings despite unforeseen roadblocks unique to this gathering. From work drawing upon a natural science core to policy analyses to philosophical dissertations to considerations of the very academic foundations of teaching about the environment, this year's conference presents a wide spectrum of scholarship and a wide variety of opportunity for discussion and exchange. Your time at this conference will be well spent and your return great.

For those returning to the fold, well met and welcome. Though smaller in number than our past meetings, it is our hope you will find us still vital and active. If this is your first participation in our conference, we hope you will find our interdisciplinary approach interesting and rewarding. We hope you will consider joining the Interdisciplinary Environmental Association and help promote a holistic understanding of the causes of – and solutions to – the environmental problems that confront our world today.

Welcome to Tucson and the 16th International Interdisciplinary Conference on the Environment. We look forward to meeting – and learning from – each of you. I hope to have the chance to speak with each of you and to encourage your participation in the IICEs and the IEA for many years to come!

Best Regards,

Eric J. Fitch

President, 2010-2011

The Interdisciplinary Environmental Association
www.ieaonline.org

CONFERENCE SCHEDULE SUMMARY

	Wednesday 22	Thursday 23	Friday 24	Saturday 25	
7:30AM					7:30AM
8:00		Gather and Registration (to 3PM)	Gather and Registration (to 3PM)		8:00
8:30					8:30
9:00		1) Educating the People in Place	6) Policy and Principles	6 th Roundtable on Environmental Systems and Sustainability (Open)	9:00
9:30		2) The Ethics of Conservation	7) Balancing Development and the Environment		9:30
10:00					10:00
10:30		Break	Break		10:30
11:00					11:00
11:30		3) Water Management 4) Sustainability	8) Integrated Management		11:30
12:00PM					12:00PM
12:30			Luncheon and Keynote Address		12:30
1:00		Arizona Luncheon	From Ivory Tower to Tilling the Soil: Universities as Catalysts for Sustainable City Design		1:00
1:30					1:30
2:00				2:00	
2:30		5) Colloquium and Workshop		2:30	
3:00		Designing Interdisciplinary Environmental Programs: The IEA Roundtables on Environmental Systems and Sustainability	9) Green Planning	3:00	
3:30				3:30	
4:00			10) Workshop	4:00	
4:30			Implementing a Curriculum in ESS:	4:30	
5:00			Evaluation of Existing Curricula	5:00	
5:30		Poster Session: Authors Available		5:30	
6:00				6:00	
6:30				6:30	
7:00				7:00	
7:30			IEA Open Business meeting	7:30	
8:00	Informal Social Mixer			8:00	
8:30				8:30	
9:00				9:00	

CONFERENCE SCHEDULE

Wednesday September 22

7pm – 9pm Informal Social Mixer, Champagne Terrace

Thursday, September 23

7:30am – 3pm Registration
Room: Foyer

8:30am – 10:15 am Session 1: Educating the People in Place
Room: Conf 1
Moderator: Mamdouh Nasr
Discussant: Susan Gill

John Cusick and Christina Monroe Sustainability Education and Public Diplomacy
Tyoku Iwamura Educating for Sustainability: A Pilot Study in an Elementary School in Rural Nepal
Penny Seymoure An Indigenous Training Program for Learning and Sharing Ecological Wisdom

8:30am – 10:15am Session 2: The Ethics of Conservation
Room: Conf 2
Moderator: Will Focht
Discussant: Michael Reiter

Gordon Steinhoff How Much Manipulation of Wilderness is Too Much?
Daniel Crescenzo The Principle of Ecological Preservation: A Guide to Moral Interaction with Ecosystems
Eric Fitch What's in a Name? The Evolution of Academic Concepts of the Study of the Natural Environment from Trivium and Quadrivium to Natural History to Environmental Science to Sustainability

10:15am - 10:45am Break
Room: Foyer

10:45am – 12:30pm Session 3: Water Management

Room: Conf 1

Moderator: Gordon Steinhoff

Discussant: Shane Epting

Susan Gill Model My Watershed: Developing a Place-Based Cyberlearning Tool for Environmental Education

D. Sanna Durgappa Threats and Human Influence on Coastal Ecosystem of Southern India

Eric Fitch Adaptation to Climate Change and Sea Level Rise in Island States and Territories of the Pacific Rim

Mamdouh Nasr Rainwater Harvesting Techniques in the Middle East and North Africa Region: Solution to Water Crises

10:45am – 12:30pm Session 4: Approaches and Paradigms in Sustainability

Room: Conf 2

Moderator: Penny Seymoure

Discussant: Ram Vemuri

Takashi Hattori Targeting The Base Of The Pyramid: How Can Enterprises Contribute To Sustainable Development?

Nozumi Imai A Pilot Study for the Construction of Sustainable Indicators in Rural Nepal

12:30pm – 2pm: Arizona Cookout

Executive Boardroom

2pm – 5 pm Session 5: Colloquium and Workshop

**Designing Interdisciplinary Environmental Programs I:
The IEA Roundtables on Environmental Systems and Sustainability**

Moderators: *Michael Reiter, Bethune-Cookman University*
Will Focht, Oklahoma State University

5 pm – 6 pm Break: Poster Authors Available

Room: Conf 2

Friday, September 24

7:30am – 3pm Registration

Room: Foyer

8:30am – 10:15am Session 6: Policy and Principles

Room: Conf 1

Moderator: Susan Gill

Discussant: Brenda Bushell

Shane Epting From the Laboratory to the Courtroom: The Benefits of Viewing Environmental Policy as a Closed System

Sivaram Vemuri Significance of Precautionary Principle for Environmental Decisions

Patrick Agbor Assibong The Niger Delta Development Commission And The Development Of The Niger Delta Region In Nigeria

8:30am – 10:15am Session 7: Balancing Development and the Environment

Room: Conf 2

Moderator: Takashi Hattori

Discussant: Eric Fitch

Jeffrey Roberg Economic Development and the Environment: Which Should Take Precedent? Tourism and the Case of the Galapagos Islands

Julie Hagan Wildlife and Recreational Organizations' Discursive Strategies and the Redefinition of Québec's Forest Regime.

Anita Agrawal Modeling of Solid Waste Leachate Characteristics - A Case Study

Sam F. Y. Li Agricultural By-Products As Biosorbents For Sequestering Heavy Metals From Water

10:15am – 10:45am Break

Room: Foyer

10:45am – 12:30pm Session 8: Integrated Management Strategies

Room: Conf 1

Moderator: Jeffrey Roberg
Discussant: Michael Reiter

Peter Beck Landowner Attitudes towards Conservation Easements in the Texas Hill Country

Alicia Frank Keoladeo National Park: Highlighting Surface Water Tensions

Shane Epting The Tension between Economic Policy and Sustainability: Questions of Justice and Global Climate Change

12:30pm – 2:30pm Conference Luncheon And Keynote Address
Location: Executive Boardroom

Keynote Address

**From Ivory Tower to Tilling the Soil:
Universities as Catalysts for Sustainable City Design**

Marc Schlossberg

Associate Professor of Planning, Public Policy & Management, University of Oregon
Associate Director, Oregon Transportation Research and Education Consortium (OTREC)
Co-Director, Sustainable Cities Initiative (SCI)

2:30pm – 4:15pm Session 9: Green Planning

Room: Conf 1

Moderator: Shane Epting

Discussant: Susan Gill

David Parsons Defining Function in Buildings: Design from the Inside Out

Sivaram Vemuri Emergence of a Green Economy: An Australian Case

4:15pm – 5:30pm Session 10: Open Roundtable

**Implementing a Curriculum in Environmental Systems and Sustainability:
Evaluation of Existing Curricula**

Moderators: *Michael Reiter, Bethune-Cookman University*
Will Focht, Oklahoma State University

Room: Conf 2

7pm – 8:30pm Open Business Meeting

Room: Conf 2

All participants are welcome to attend

Saturday, July 10

9am- 4pm 6th Roundtable on Environmental Systems and Sustainability

Open to All Participants

Moderators: *Michael Reiter, Bethune-Cookman University*

Will Focht, Oklahoma State University

Room: Conf 2

ABSTRACTS

1. KEYNOTE BIOGRAPHIES AND ABSTRACTS

Marc Schlossberg

Associate Professor of Planning, Public Policy & Management, University of Oregon
Associate Director, Oregon Transportation Research and Education Consortium (OTREC)
Co-Director, Sustainable Cities Initiative (SCI)

Marc Schlossberg is an Associate Professor of Planning, Public Policy & Management at the University of Oregon; Associate Director of the Oregon Transportation research and Education Consortium (OTREC), and Co-Director of the Sustainable Cities Initiative (SCI). In 2009, Professor Schlossberg was awarded one of only five Fulbright Scholarships to the United Kingdom and focused his work on sustainable transportation. In 2008, Professor Schlossberg was recognized as one of the top twenty faculty on campus with a Faculty Fund for Excellence. In 2002, he was selected as one of twenty top young transportation scholars in the United States and participated in a cross-Atlantic dialogue on the future transportation research agenda. He holds a PhD from the University of Michigan's Urban, Technological and Environmental Planning program with a certificate in Transportation Logistics Planning.

Professor Schlossberg's research and teaching focus on sustainable community design with a special emphasis on sustainable and active transportation. In particular, his work also focuses on the use of GIS in bottom-up, citizen-engaged planning. Professor Schlossberg is well published in top academic journals on issues of walkability assessments, children's journeys to school, and participatory GIS.

From Ivory Tower to Tilling the Soil: Universities as Catalysts for Sustainable City Design

Are Professors really stuck in their Ivory Tower? Is higher education relevant? Can Universities really catalyze community change? This talk and discussion will focus on an urgent new role for higher education institutions to be the catalysts for sustainable city design. This event will focus on the Sustainable Cities Initiative (SCI) and its Sustainable City Year program at the University of Oregon, a program that helps direct expertise of faculty and students toward a single city to help on sustainability issues. In this model of education, students get hands on experience in working with city officials and city officials get a range of new ideas from the next generation of thinkers and practitioners.

During the 2009-10 year, the Sustainable City Year program worked with the City of Gresham (Oregon) and directed 15 faculty, 24 courses, 7 disciplines, and about 100,000 hours of student and faculty effort toward the city's needs. For the 2010-11 year, even more faculty and disciplines are involved to work with the City of Salem (Oregon). In addition, this course-based and service work is directly connected to an active research agenda and direct engagement with national policy. It's not rocket science, so what will it take for other institutions to follow suit?

Michael A. Reiter

Associate Professor and Chair, Department of Integrated Environmental Science, Bethune-Cookman University
Co-Chair, ESS Roundtables

Michael Reiter is Associate Professor of Environmental Science at Bethune-Cookman University, where he serves as the Chair of the Department of Integrated Environmental Science. Dr. Reiter is a past President and Chair of the Advisory Board of the Interdisciplinary Environmental Association, past Editor for the international journal *Interdisciplinary Environmental Review*, and current co-chair for the IEA Roundtable on Environmental Systems and Sustainability. He is the Lead PI for the Integrated Assessment thematic area of the Environmental Cooperative Science Center, a NOAA-sponsored consortium of universities that work on integrated assessment strategies for coastal communities and ecosystems. Dr. Reiter has received grants from NOAA, the USDA, and The Nature Conservancy, and is also a member of the Ecological Society of America and the Union of Concerned Scientists. He has received university awards and has been nominated for regional awards for his research, and has been invited to speak on his work in the United States, Canada, Europe, Australia, and Africa. Dr. Reiter has also received university and national awards for his teaching, has developed service-learning relationships with several state parks and National Estuarine Research Reserves in Florida, Delaware, and Indiana, and has helped organize international field courses and related student opportunities in several countries.

Dr. Reiter holds a B.S. in Biology from Muskingum College in Ohio, an M.S. in Biology from Kent State University in Ohio, and a Ph.D. in Environmental Sciences from the University of Virginia.

**Designing Interdisciplinary Environmental Programs:
The IEA Roundtables on Environmental Systems and Sustainability**

The term “sustainability” has been co-opted for so many different contexts that it has nearly lost any meaningful utility, yet the importance of the concept cannot be over-stated. Using past conference sessions and workshops as background, the Interdisciplinary Environmental Association’s Roundtable on sustainability education has devoted more than a year to deliberation on how higher education can best prepare its faculty and graduates for scholarship, careers, and informing citizens in sustainability. The Roundtable has defined a subfield of environmental sciences and studies labeled Environmental Systems and Sustainability (ESS), the goal of which is the holistic, adaptive management of the health and resilience of the systems at the human-nature interface necessary to support both stewardship of the natural environment and long-term improvement of the human condition. A fundamental principle in our vision is that sustainability can be achieved only through a coherent, integrated synthesis of disciplines aimed at the systems located at this interface. Sustainable outcomes, we believe, depend on healthy ecological, social, technological, economic, and governance systems. In support of this vision of a holistic, integrated field labeled ESS, the Roundtable has developed curricula guidelines, program designs, core competencies, and suggested administrative structures that we believe will

make integrated ESS education effective. This talk will introduce the proposals of the Interdisciplinary Environmental Association's Roundtable on Environmental Systems and Sustainability, and form the foundation for a series of subsequent practical breakout sessions where participants can evaluate and attempt to apply the proposals to their existing or developing programs in ESS, and obtain information and answers to their own ESS programmatic or course questions.

2. CONTRIBUTED POSTER PRESENTATIONS (*Presenter/Contact)
Alphabetical by Indicated Presenter.

**Maize Monoculture and Environmental Sustainability:
Assessing the Case of Sinaloa, Mexico**

Julia C. Bausch, School of Sustainability, Arizona State University
Dr. Hallie Eakin, Assistant Professor, School of Sustainability, Arizona State University
Dr. Luis A. Bojorquez-Tapia, Professor, Institute of Ecology, National Autonomous
University of Mexico, Mexico City
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In Mexico, maize (*Zea mays*) is the most significant crop for the economy, industry, policy, environment, food supply, and culture. Over the last two decades the geography of maize has significantly changed: in the period from 1990 to 2009, Sinaloa, a coastal state in the semi-arid north known for irrigated tomato production, went from negligible maize cultivation to supplying almost a quarter of the country's white maize. Having modeled production after the United States Corn Belt, high-yielding, irrigated maize is now a monoculture in Sinaloa, occupying as much as 90% of the planted area in some irrigation districts. Corn Belt history, however, has illustrated that over time, high productivity can result in significant environmental costs that are not seriously considered or monitored in Sinaloa today. In addition to potential negative environmental outcomes, Sinaloa maize production bears important implications for food security and rural development in Mexico, making it a sustainability question with economic, social and environmental dynamics. This poster presents preliminary results of an assessment of environmental sustainability of maize farming in Sinaloa. Our analysis is based on interviews with regional experts and a compilation of relevant statistical data, which we use to construct indicators of sustainable agriculture. These indicators are interpreted through Multicriteria Decision Analysis to assess sustainability threats and the environmental consequences of maize expansion in Sinaloa.

**Community Gardening in Disadvantaged Neighborhoods in Phoenix, Arizona:
Aligning Programs with Perceptions.**

Tommy Bleasdale, Carolyn Crouch, Dr. Sharon Harlan

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The multiple benefits of community gardening in low-income communities of color are widely accepted in the academic literature and by urban agriculture advocates. Nevertheless, community garden programs struggle with declining membership and eventual abandonment. This study used an exploratory survey to understand neighborhood perceptions of gardening and to contrast those perceptions with a local community gardening initiative spearheaded by community organizers. Neighborhood interest in gardening and community gardens in particular appears to be robust. The survey identified a demographic profile of potential community gardeners. Tensions are found, however, among diverse stakeholders in the gardening initiative. The stated intentions of the organizers' plan did not closely match the residents' perceptions of community gardens. Careful and continued engagement with stakeholders in the gardening movement will aid in creating gardens that are "owned" by the community.

Undergraduate Knowledge and Acceptance of Human-Induced Climate Change

Jonas J. Schoenefeld and Dr. Barbara K. Hofer
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The American public assigns little political importance to climate change, which ranks last among twenty issues (Pew Research Center, 2010). Yet, a growing interdisciplinary academic community agrees that climate change is the most pressing environmental issue of our time. Psychology is important in the interdisciplinary and urgent process to mitigate climate change, because a better understanding of human cognition, beliefs and behaviors related to climate change is instrumental to effect change (Nickerson, 2003; Kazdin, 2009).

The current study investigates the relationships among knowledge, acceptance, intended behavior, and science beliefs, regarding human-induced climate change. In an online survey conducted with 69 mostly first-year students at a liberal arts college, 55% ranked global warming a top political priority. Participants exhibited relatively high acceptance of human-induced climate change ($M = 76.86$, maximum = 100). They correctly answered about half of 17 multiple choice questions evaluating knowledge about climate change. Personal willingness to reduce their own impact was low, however, ($M = 2.49$; maximum = 4). The correlation between knowledge and acceptance of climate change approached significance (Pearson's $r = .194$, $p = 0.11$). We found a significant positive correlation between acceptance of human-induced climate change and willingness to act, $r = .596$, $p < 0.01$. Relative importance of environmental protection as well as general and personal importance of climate change, and emotional significance, were positively correlated with acceptance of climate change and willingness to act (Pearson's r between 0.520 and 0.605, all significant at $p < 0.01$); more sophisticated beliefs about science also related to higher acceptance ($r = .252$, $p < 0.01$).

Results suggest that perceived importance of climate change, as well as sophisticated beliefs about science, are important factors that may drive acceptance of climate change and willingness to take action. Implications for education and public policy will be discussed.

3. CONTRIBUTED ORAL PRESENTATIONS (*Presenter/Contact)
Alphabetical by Indicated Presenter.

**The Niger Delta Development Commission And The Development Of The Niger Delta
Region In Nigeria**

Patrick Agbor Assibong
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This paper examines the attempt made by the people and governments of Nigeria to address the highly vexing and contentious issues of resource control, environmental protection and the development of the Niger Delta Region in Nigeria, highlighting earlier attempts via the COR State Movement, the Willinck's Commission and the ephemeral OMPADEC intervention in the 1980s. The primary reason for the failure of previous attempts at developing the Niger Delta region, the paper contends, resides in the dialectics of the character and disposition of those implementing the multifarious policies institutionalized to address the issues involved in the development of the region. From this basic premise, the paper concludes, it is now left for the authorities of the Niger Delta Development Commission (NDDC) to learn from the dysfunctions of OMPADEC, restructure the objectives and policy options of the NDDC to create meaningful roles for the: (i) native population so that they should be involved in the development process and stop being hostile to the workers of oil companies (ii) multinational corporations operating in the region so that they can stop the seemingly interminable series of uncontrollable oil spillages which have destroyed fauna and flora and (iii) non-governmental organizations and other civil society organizations in order for them to help reeducate the population on the necessity of working together with the oil companies for the development of their region if the NDDC is to succeed.

Modeling of Solid Waste Leachate Characteristics -A Case Study

Anita Agrawal
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Ill-managed municipal solid waste, have lead to the serious socio-environmental problem in developing countries like India. The current practice of uncontrolled dumping of municipal solid waste on the outskirts of towns/cities has created several environmental as well as public health problems. The municipal solid waste forms leachate, after coming in contact with the rainwater. The quantity and quality of leachate depends upon several physical and chemical parameters. Determining the relationship between the characteristics of leachate and the characteristic of solid waste is of considerable importance for effective management of solid waste. In the present study an attempt has been made to investigate the relationship between the characteristics of leachate and the characteristics of municipal solid waste, using Artificial Neural Network. The result of the study shows a definite trend of relationship between characteristics of municipal solid waste and the characteristics of leachate.

Landowner Attitudes towards Conservation Easements in the Texas Hill Country

Peter Beck
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Conservation easements, in which landowners forfeit development rights to a public or private organization while retaining rights to own and reside on their land, are becoming an increasingly popular tool for land conservation. Easements address some of the primary limitations of land conservation: the high cost and frequent public antagonism towards public purchases of land while providing economic compensation to the landowner for the opportunity cost of not developing land (Boyd et al, 2006). Despite this popularity, there is little evidence in the literature indicating that the tax breaks offered by easements are a sufficient incentive to encourage landowners to forgo development. This study addresses this limitation by reporting results of a survey of Texas landowners in the Hill Country region where conservation agencies are relying heavily on easements to slow the area's rapid development. Survey results suggest that although the economic benefits offered are rarely a sufficient incentive to influence decisions, they are a valuable tool for the many landowners who are motivated primarily by non-economic factors.

The Principle of Ecological Preservation: A Guide to Moral Interaction with Ecosystems

Daniel L. Crescenzo
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Aldo Leopold famously argued that we are plain citizens of the biotic community, and that our relationship with this community is therefore an ethical one. I propose a normative principle to guide our interactions with ecosystems in accordance with Leopold's ecocentrism: the principle of ecological preservation. According to this principle, actions which preserve the evolved dynamic relationships between species and between species and their environment within a given ecosystem should be promoted, and those which do not should be discouraged. I argue that the principle of ecological preservation calls upon us to stop or prevent uniquely severe disruptions of ecosystems – disruptions that destroy their characteristic function rather than contributing to the evolution of that function. I further argue that although uniquely severe disruptions do not always originate in human action, we have good reason to focus our application of the principle of ecological preservation on mediating our own actions. Finally, I examine a hypothetical proposal to introduce mountain lions (*Puma concolor*) into southwestern North Carolina and adjacent areas of Tennessee, South Carolina, and Georgia in order to control wild boar (*Sus scrofa*) populations. I conclude that it would be morally right to do so according to the principle of ecological preservation.

Sustainability Education and Public Diplomacy

John Cusick
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Funded by the United States Department of State's Bureau of Educational and Cultural Affairs, the Study of the United States Institute for Student Leaders on Global Environmental Issues organized by the East-West Center hosted 40 undergraduate and graduate students from Southeast Asia on two six-week programs in May–June 2009 and 2010. Through involvement in the institutes, participants gained an understanding of the environmental movement in the US by engaging advocacy, market, policy, cultural, and scientific perspectives to environmental issues and seeing how these approaches are intertwined in the quest for developing sustainable pathways to environmental stewardship. The institute was informed by and engaged with a diverse range of stakeholders, from government policy and resource management representatives, indigenous and community activists, educators and researchers, and for-profit companies and non-profit organizations in the State of Hawai'i and the US mainland. The curriculum was designed to maximize experiential learning through a variety of readings, written

and oral exercises, and field site activities that demonstrated the dynamic complexity of environmental stewardship. Education for Sustainable Development provided a framework to design a program with outcomes that included public diplomacy. The take-home lessons of each participant and the long-term cumulative impacts they will have in their respective fields of study and places of residence will ultimately measure success. This presentation will review learning objectives and outcomes, as well as discuss preliminary results of participant implementation of action plans upon return to their home countries.

Threats and Human Influence on Coastal Ecosystem of Southern India

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There is a need to develop a framework to integrate biodiversity effects methods with risk assessment methodology. Such integration will improve the basis for risk-based assessment of coastal health. To protect estuary and coastal ecosystems and the health of communities effectively, management infrastructure requires the tools and resources necessary to detect damage to estuary and coastal ecosystems and their components, identify causative agents, impose remedial action, and demonstrate that measures have been effective. In contrast, bottom-up restoration strategies not only simplify planning, but they recognize that basal ecological mechanisms are what define coastal ecosystems. Populations of the majority of fish species showed drastic reduction over the past five decades in west coast of India. We conducted an intensive study of Aghanashini estuary for water quality and fish diversity in west coast of India. Coastal ecosystems are impacted by many stressors and are continually subjected to threats from multiple stresses imposed mostly by human activities predominantly as a result of increased population growth in India. The most significant categories of threats derive from water pollution from numerous sources including thermal effluents, heavy metals, oil, sewage, pesticides, pulp mills, habitat loss and degradation: overexploitation: eutrophication and misguided human perceptions. Wide array of prohibited fishing methods are rampant by using of insecticides as poisons, destruction and modification of habitats, dynamiting, using chemical and herbal poisons. Due to deteriorated water quality from anthropogenic activities fish diversity has drastically reduced. In complex coastal ecosystems, strategies for restoration can become equally complicated. Our tendency to want to predict and establish performance targets for the charismatic megafauna which populate the higher trophic levels of an ecosystem may reduce our ability to actually implement restoration plans. The problem confronting coastal resource managers in the west coast of India is analogous to the question of whether economic policy makers in India should be focusing on restoring the fundamentals of capitalism. Pragmatic monitoring and prediction capabilities must also be built to provide further confidence that human impacts are being minimized.

From the Laboratory to the Courtroom: The Benefits of Viewing Environmental Policy as a Closed System

Shane Epting
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Laws and policies, embedded with values, follow a pattern: the more we value something, the greater the extent to which we aim to protect it. Usually, what we protect are rights such as free speech, assembly, and fair trial. As society changes, we change what we value and want to protect. Evidence of global climate change starts with scientists putting forth evidence-based claims that anthropogenic environmental degradation has put the Earth and humankind in danger. As the public starts to understand the degree to which we are in harm's way, the public starts to value other rights more, such as the right to breathe clean air and drink clean water. Yet, we need policy and laws that protect these rights because we cannot depend on industries to consider the best interests of the biosphere. The purpose of this discussion is to show that if we understand how environmental policy functions, then we also understand how to expedite the process that allows us to safeguard against additional anthropogenic environmental degradation. It is argued here that viewing environmental policy and law as a closed system, even though difficult at times, offers an avenue to ensure that our environmental values have a means for protection.

The Tension between Economic Policy and Sustainability: Questions of Justice and Global Climate Change

Shane Epting
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Trying to identify the stakeholders impacted by economic policy is a daunting task when considering that many remain in the periphery. Economic policy, by definition, primarily focuses on humankind while the environment remains secondary and is looked at only for its instrumental value most of the time. Looking at the environment as secondary becomes problematic because it also, to a degree, holds a stake in economic policy, but it does not qualify as a stakeholder. Yet, this view is correct because humankind depends on the environment and the environment does not depend on us. In light of global climate change, however, the situation appears that the environment does depend on us, but this is only appropriate in a strict sense: it is appropriate when questions concerning environmental thresholds enter the picture. Nevertheless, the manner in which we conceive of "thresholds" exhibits that they are embedded with anthropocentric concerns. While questions concerning thresholds from a non-anthropocentric perspective would yield better results, humankind is always situated within an anthropocentric framework. Humankind working within this framework means that we have to consider that the environment's concerns are in turn our concerns. In terms of economic policy

and sustainability, promoting policy that favors the environment's well-being, as a result, favors the well-being on humankind. Therefore, the purpose of this paper is to exhibit how we can promote economic policy that has a proclivity towards reconciling environmental and social justice.

Adaptation to Climate Change and Sea Level Rise in Island States and Territories of the Pacific Rim

Eric J. Fitch
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Sea levels are rising across the planet, and the rate of rise is increasing. A firm consensus confirms a strong linkage to climate change. Sea level rise has been independently verified as occurring and accelerating. The coastal zones of most countries are areas of critical habitat, high primary productivity, and fragile geographies constantly in struggle against the sea. Coasts are also prime human habitat and locations for most global metropolitan centers, and highest population concentration. In coastal countries which have a significant hinterlands, planning discussions generally revolve around what can be done to physically prevent loss of lands to the sea and/or where to retreat above the "rising tide". But, 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. Vietnam and Bangladesh are being confronted with the loss of much of their habitable lands in less than 50 years if the rate of sea level rise follows the current consensus projections, and more recent data seems to indicate that sea level rise is accelerating. Kiribati and the Maldives have already lost islands to the sea. Nauru has to mine out its phosphate resources to fund an exodus. Niue, though unaffected by sea level rise, has lost most of its population due to related economic and environmental impacts. Even Australia will feel the effects; 95% of Australia's population lives within 60 km. of their coasts. Their interior is becoming progressively drier with climate change. Squeezed by this wet/dry dynamic, they watch another wave arise. In Oceania and around the Pacific Rim, questions are asked regarding a new Oceanic diaspora. Ecogeographic environmental refugees) are already a recognized demographic phenomenon. Where will ecogeographic refugees from these regions migrate once the sea overcomes their livelihoods? What can nations and international organizations do to help? With "refugia" like the U.S.A. and Australia tightening immigration policies, are there solutions?

What's in a Name? The Evolution of academic concepts of the study of the natural environment from Trivium and Quadrivium to Natural History to Environmental Science to Sustainability

Eric J. Fitch

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An essential part of the concept of the human societies and cultures is the acquisition and dispersion of knowledge and understanding. Through human history, one of the central concepts that has always been a subject of study is the natural world, its components and human interaction with them. The driving motivation has been first survival and then increasing exploitation for expansion of the human niche. During the “Long Summer” (from the last major Ice Age to present), collection of knowledge and its application have evolved from a model of “indigenous knowledge” to the structured multi-tiered social construct called “academe” or “the Academy”. This study will address the evolution of concepts and terms dealing with the natural environment and humans place within that environment from natural philosophy through natural science, disciplinary environmental sciences and conservation, through environmental science to sustainability.

Keoladeo National Park: Highlighting Surface Water Tensions

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Keoladeo National Park (KNP) of Rajasthan, India is a man-made wetland and bird sanctuary designated as a UNESCO World Heritage Site and Ramsar Wetland of International Importance. The park is one of the world’s premier bird watching destinations, serving as a wintering and breeding ground for over 300 species of waterfowl. In recent years, however, KNP has suffered serious ecological stress from a reoccurring scarcity of water due to both drought and upstream dam construction. The resulting drying of the wetland presents a threat to the park's future as a World Heritage Site and popular tourist destination. The Central Government of India and the State Government of Rajasthan have proposed to construct a dedicated 17 km pipeline to divert water to the park. Both the dam-induced water shortage at KNP and the proposed pipeline solution raise the question of whether the surface water is allocated in a sufficient and equitable manner. Among those vying for direct access to this limited flow of water are farmers upstream of the dam, downstream farmers, and park management acting on behalf of the migratory bird population. Additionally, wildlife NGOs, domestic and foreign tourists, the Rajasthan State Government, the Indian Central Government, and UNESCO have vested interests in securing an outcome favorable to their constituencies.

The issues related to the allocation of surface water near KNP present an opportunity to compare the socially efficient outcome to the one agreed upon by lawmakers. Based on interviews I conducted in May and June, this comparison accounts for the rich historical and social context of the dispute, how that context affects the desirability of potential outcomes, and the various

stakeholder perceptions of an ultimately unique political resolution. The case of KNP highlights the regional tensions and environmental controversy of allocating water in a water-scarce developing nation.

Model My Watershed: Developing a Place-Based Cyberlearning Tool for Environmental Education

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Intricate and interlocking factors (e.g., elevation, geology, vegetation, latitude and climate) create a complex tapestry of patterns on the landscape. Until recently, understanding those patterns was a daunting exercise. However, with the increasing availability of environmental data and progressively more powerful geospatial analytical tools, it is now possible to de-couple these factors and to identify and analyze the underlying processes that link them. Arguably, of all of the factors shaping the environment, water has the most impact on these patterns. The causes of alterations to the global water cycle have their roots in local land-use change. Consequently, forging solutions also requires a local perspective. This is particularly true for youth, for whom a global perspective may be overwhelming. The Model My Watershed project, funded by the National Science Foundation, uses existing scientific data and the Penn State Integrated Hydrologic Model (PIHM) to build an authentic, hydrologic modeling tool-set. Using geographic information system (GIS) technology, students can predict how environmental changes to the ecosystem will affect the hydrologic cycle in their local watersheds. By modifying both environmental conditions and algorithms, students can predict hydrologic changes in their region, their watershed and their own backyards.

Working with both math and science secondary-school teachers from 12 schools in metropolitan Philadelphia, Pennsylvania, this project is based on a firm belief that providing students with an authentic, exciting, intuitive and interactive tool set that allows them to investigate their own neighborhoods will convey the dynamic nature of science, display the relevance of scientific knowledge to real-world decision making and entice students to explore STEM (Science, Technology, Engineering and Mathematics) careers.

Wildlife and Recreational Organizations Discursive Strategies and the Redefinition of Québec's Forest Regime

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In Québec, the forest sector industry and the public administration both play a dominant role in forest management. However, with the growing public concern for environmental issues, ecologists groups came to play a key-role as the watchdog of forest practices. The democratization of recreational and touristic activities – such as hunting and fishing – and the growing popularity of outdoor sports gave rise to a new group of stakeholders interested in the management of forest: the wildlife and recreational organizations. The convergence of those trends lead to an increase in the diversity of values and conflicting interests around forest management. Thus, Quebec’s government began to use public participation as a solution to mediate the conflicting interests surrounding forest resources. It is assumed that public participation processes allow subordinate social actors to be acknowledged while fostering alliances and promoting shared-meaning. Our case study of the Coulombe Commission on the sustainability of public forest management in Québec illustrates: how wildlife and recreational stakeholders used a public participation process to gain recognition; how those organizations came to form a discursive – and sometime strategic – alliance with influential environmental groups and how, at the same time, they attempted to make a strategic use of economical arguments. However dynamic the redefinition of Québec’s forest regime, the economic discourse remains dominant and the arguments most likely to be taken into account are those combining environmental and economical preoccupations. This calls for further investigation of the impact and coherence of the discursive strategies used by social actors in the context of public participation in natural resources management.

**Targeting The Base Of The Pyramid:
How Can Enterprises Contribute To Sustainable Development?**

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Sustainable development has been sought for decades, and struggles to find the best approaches have been continued. There is a non-traditional approach with collaboration among various sectors to address the poverty reduction issue, which is to access the “Bottom/Base of the Pyramid (BOP)” as consumers and/or as co-producers. Japanese enterprises have gradually shown some interests in approaching the market in the base of the economic pyramid in developing countries. This paper presents ten case studies in which Japanese enterprises conducted the assessment of whether their “BOP business” can be applicable in particular developing countries. Based on the case studies, this paper will draw some suggestions for enterprises and other stakeholders to promote sustainable development in developing countries.

A Pilot Study for the Construction of Sustainable Indicators in Rural Nepal

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Since the concept of sustainable development emerged out of the Brundtland Report in 1987, various strategies have been put forward with the vision of measuring progress towards achieving sustainability under the pillars of economy, environment and society. One of the more common strategies is to develop sustainability indicators through the integration of human needs along with environmental and economic considerations. Creating effective indicators involves challenges, however, in finding common ground between the individual interests of all stakeholders and the interest of the community as a whole. In an attempt to meet these challenges, this paper reports on a small pilot study to develop a set of sustainable community indicators for use in monitoring progress towards sustainability in two rural communities in Nepal. Members from the communities were surveyed to identify the indicators they value most for the sustainable development of their communities.

Findings from the survey highlight the importance of a wide range of community perspectives in constructing the indicators, and the possible synergy that can be created towards the mobilization of a sustainable community. The research also illustrates the importance of the integration of the “people issues” into the planning and policy decision-making in the communities. Furthermore, it suggests the need for more coordinated efforts in developing the social and economic systems that work in harmony with the environmental systems to support sustainable development in these communities.

Educating for Sustainability: A Pilot Study in an Elementary School in Rural Nepal

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Mounting concern over environment and development problems has meant greater support for an educational approach, which not only considers immediate environmental improvement as an actual goal, but also addresses educating for 'sustainability' in the long term. However, the idea of sustainability can materialize only if the current and future generations are aware of its value. In this regard, the lessons children receive at school can play a vital role. This presentation describes a small pilot study carried out on forty-three children from one elementary school in rural Nepal. While exposed to class lectures *about* sustainability, the children have few opportunities to engage in activities *for* sustainability outside the classroom. Therefore, the research targets education *for* sustainability, incorporating participatory learning on issues that are pertinent to their society's sustainable development.

Findings from this study show that not only the children's knowledge and awareness on sustainability improved, but their motivation and capacity to analyze, and plan to manage change towards sustainability in their community were enhanced. Results from this research suggest that exposure to real issues in the community through educational activities can help ensure that the next generation is aware and equipped to carry out sustainable practices.

Beyond Equity? Interdisciplinary Analyses for Environmental History

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Environmental justice has been part of the academic discourse in the United States for decades. While the definition of environmental justice has continually broadened, only more recent analyses have moved beyond discussing equity or the equal distribution of environmental "goods" and "bads." It is consequentially not surprising that such recent shifts have rarely been noticed or included within environmental history. Going beyond equity, my paper argues that environmental justice can be a useful historical lens or framework of analysis. More precisely, I

claim that a broad definition of environmental justice allows historians to draw from various theoretical conceptions in their analysis. This makes environmental justice theory an interdisciplinary tool and an excellent theoretical conception.

In order to adequately sustain this claim, I focus on the rise of the German Greens (*Bündnis90/DieGrünen*) in post-WW II Germany. Clearly a topic widely discussed within political science and history, the use of environmental justice theory allows a nuanced perspective. By concentrating on community initiatives (*Bürgerinitiativen*) dominant in East and West Germany early on, my paper highlights, questions, and challenges existing interpretations based on a variety of primary and secondary sources. Overall, the utilization of environmental justice theory as a historical lens achieves various objectives. By presenting a unique interpretation of the rise of the German Greens I am able to question still prevailing trends within its historiography. In addition, my paper illustrates the importance of social and environmental justice for the rise of the German Greens. Both aspects ultimately hope to encourage other environmental historians to utilize environmental justice theory as an interdisciplinary tool of analysis.

Agricultural By-Products As Biosorbents For Sequestering Heavy Metals From Water

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Agricultural by-products have been widely studied for the removal of toxic metals from water in recent years. Some of these are: peat, wood, pine bark, banana pith, soybean, cottonseed hulls, peanut shell, hazelnut shell, rice husk, sawdust, wool, orange peel, compost, humic substances, and leaves. For example, the residual waste pulp after the extraction of oil palm has been found to be highly efficient in the removal of heavy metals, including cadmium, lead and mercury from water. Similarly some other natural waste materials can be used for removing other organic pollutants. In view of the large consumption of water, and the very high demand for water treatment products, there exist huge potential and numerous opportunities to create wealth from agricultural wastes.

Rainwater Harvesting Techniques in the Middle East and North Africa Region: Solution to Water Crises

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One important reason for political instability in the MENA region is water management and the control of desertification, including the absence of institutions for regional collaboration on important collective water management issues such as Nile-basin trans-boundary water

management and the Euphrates-basin water management committee. International efforts are currently difficult to organize due to the influence of national political strategies and interests, and the present fragmentation of sustainable development programs and governance structures plus the need for large investment limits NGO mainstreaming of innovative approaches at regional, national and local levels. In the absence of strong international institutions, country-by-country rainwater harvesting techniques may be a solution for avoiding a costly dispute resolution process. Using methods such as (a) surface rain water storage using underground tanks, ponds, check dams, weirs etc.; and (b) recharge to groundwater using recharge pits and wells, lateral shafts, spreading techniques usable when permeable surface strata exist, etc., local groups can obtain as much as 60 percent of their local water requirements, reducing the need for drawing from larger-scale water supplies. The money saved can then be used for required investment in sustainable agricultural development. A beneficial effect of the use of these methods is the potential reduction in international conflict that a more abundant water supply could cause. The financial support and integration of these methods into national policy could thus be highly beneficial both on local and regional scales.

Defining Function in Buildings: Design from the Inside Out

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This paper addresses issues regarding the definition of function in the design of working environments within buildings. A much quoted axiom of modernist design is that form follows function. However a review of the literature from that period shows that the primacy of functionalism in relation to other considerations was the subject of much debate at the time. The design of any building involves balancing a range of requirements with issues such as energy efficiency and environmental impact becoming more prominent recently. Nevertheless one of the primary considerations must be fulfilling the function for which the space is created. This paper takes as the primary focus for the definition of function the needs of the occupiers and illustrates the complexities involved using two examples. The first concerns the design of health care environments showing how the needs of users from different medical backgrounds and spiritual traditions may incorporate the paradigms of Complementary and Alternative Medicine. This section also explores how the holistic view of healing which emphasizes the experience of the patient may create a different environment from the analysis of function based on the efficiency of modern medical practice in large hospitals.

The second example deals with the range of functions for workers in office environments. Looking at buildings from the perspectives of the users with their definitions of the functions of spaces and their assessment of the importance of these uses could result in spaces which motivate workers and create a sense of wellbeing. This is contrasted to the more narrowly mechanistic Fordist production line approach to office design which tends to drive up worker

density. Both examples suggest that design should be approached from the *inside out* beginning with a close analysis of the function from the point of view of the day to day users.

Economic Development and the Environment: Which Should Take Precedent? Tourism and the Case of the Galapagos Islands

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Environmentalists and conservationists often argue that we must preserve some area for future generations to enjoy. While this is certainly a nice sentiment, and even a moral argument can be constructed to support this point, it is worth questioning whether future generations, and the current one, have a “right” to a healthy, beautiful environment. In particular, sometimes these efforts at conservation come into conflict with economic development and the ability of individuals to have an adequate standard of living. If Environmental Rights exist, what happens when they conflict with more traditional Human Rights? This research explores the above question as it relates to the Galapagos Islands and will provide a discussion of environmental rights and human rights followed by an examination of the Galapagos Islands and the many stakeholders involved in the management of the Islands. This study also explores where tourists fit into the argument between environmentalists and local businesses and discusses ecotourism as a possible solution.

An Indigenous Training Program for Learning and Sharing Ecological Wisdom

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Over the last 20 years, the government of Misiones Province in northeast Argentina has moved many of the indigenous Mbya Guaraní people into small land areas that are not large enough to maintain a community through traditional patterns of hunting, collection, and conservation of forest resources. This has resulted in changes in diet and food sources, especially in Mbya communities that are situated near provincial towns, such as Puerto Iguazú and the Iguazú Waterfalls. One consequence of these changes has been that many younger community members do not possess the knowledge or understanding of the rainforest environment and the flora and fauna that have been part of their traditional culture. Additionally these adolescents and young adults have little education or opportunity for work, leaving some of them anxious about their futures. In 2005 a training program known as the Argentine Model for Tourism and Employment (Project MATE) was inaugurated to prepare impoverished individuals to work in

the tourist industry in the province. Included within the program were courses explicitly directed toward preparing the Mbya to become guides for tourists. The course training materials were developed from audiovisual presentations by Mbya elders from different communities who explained diverse subjects about their traditional culture and knowledge of the environment. The first classes began in 2007 with students learning in an intercultural manner how to discuss nature, birds, and vegetation with tourists. Since then approximately 45 Mbya and Chiripá have graduated from the program. This research will discuss the progress of the program and examine whether the program has been effective in (a) re-educating Mbya youths in traditional environmental knowledge and (b) creating employment opportunities for them.

Post-Modern Peasantry: A Paradigm for a Sustainable Future?

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From the collapse of the Roman Empire until the 1300s, social change in Europe built toward a “proto-Renaissance”. Farming was transformed, average longevity increased, and the crafts flourished. Improvements were built on institutionalized social capital among farmers, monks, women in beguine houses, and fraternally-associated craftsmen. The semi-autonomous village was the institution that sustained agricultural change, while holding the demands of the seigniorial class of landlords and bishops at bay. By the mid-14th century, the onslaughts of plague, professional armies, urban domination of agriculture, and a militant church disrupted the system of communal villages to the point where they were unable to adjust as the climate sharply cooled. This paper argues that the early Middle Ages holds lessons for the present as we confront the depletion of fossil fuels, the unraveling of cheap long-distance transportation, the pluralism of cross-border economic migration, and challenges to the global food system due to climate changes resulting from atmospheric carbon accumulation.

How Much Manipulation of Wilderness is Too Much?

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The Wilderness Act of 1964 prohibits roads, motor vehicles, motorized equipment, mechanical transport, and structures and installations within federally designated wilderness areas. Yet the Act includes an important clause that allows exceptions to the general prohibitions. According to the Act, generally prohibited uses are allowed within a wilderness area “as necessary to meet

minimum requirements for the administration of the area for the purpose of this Act.” This obscure clause has been widely misinterpreted by federal agencies so that it is far too vague, allowing manipulations that are too extensive and destructive of wilderness resources. One example is the construction of watering facilities (“guzzlers”) for desert bighorn sheep in the Kofa Wilderness Area in Arizona. The issue that will be addressed in this paper is: how much manipulation of wilderness is too much? This paper will present a more precise and correct interpretation of the above exception clause. Properly interpreted, the Wilderness Act allows needed manipulations of wilderness such as the construction of trails and bridges, yet rules out actions that are too destructive.

Emergence of a Green Economy: An Australian Case

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Green Economy is defined in this paper as “one in which the vital links between economy, society, and environment are taken into account and in which the transformation of production processes, production and consumption patterns, while contributing to a reduction per unit in reduced waste, pollution, and the use of resources, materials, and energy, waste, and pollution emission will revitalize and diversify economies, create decent employment opportunities, promote sustainable trade, reduce poverty, and improve equity and income distribution” (An Introduction to the Green Economy Report, 2010). Despite such a comprehensive description, the global financial crisis narrowed the focus of attention to environment and employment aspects of a modern economy causing an inadvertent effect of bipolarization of issues related to climate change and development pursuits. Discussions involving the global financial crisis eventually ended up in economic-environment bipolarity and impacted on deliberations related to green economy in at least two areas that concerns this paper. The pace towards moving to a green economy as we have come to know in the mainstream was expedited. Such increases in tempo propelled global movement and modern economies initially to adopt discontinuous innovative strategies and move towards a green economy. In short, the global finance and climate crisis has resulted in propelling urgent actions to examine simultaneous delivery of twin objectives – environmental betterment and economic prosperity through labor market involvement. Australia, the focal point of this paper, was no exception in responding to these global concerns.

Significance of Precautionary Principle for Environmental Decisions

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Knowledge management is “the process of capturing and making use of ...collective expertise” (Awad & Ghaziri, 2004: 3). The thorny question seems to be what happens when there is uncertainty, either real or imaginary, about the science behind knowledge. Peel (2005) suggests putting precautionary process into practice by “broadening the base of decision-making...necessitating a combination of expert and broad-based mechanisms throughout the process.” (Peel, 2005: 226). World Summit on Climate change in Copenhagen adopted such a broad based consultative process. What eventuated was an impasse that most feel must be avoided. As a result there are concerted attempts to avoid future clashes of interest. This paper is concerned with what needs to be done in the future to avoid such gridlocks.

A number of approaches are emerging. Many continue to search for alternatives to the current process of consultations. Some recognize the enormity of the challenge posed and propose guidelines to improve the reconstruction of knowledge by building bridges between knowledge systems. Others work towards providing better incentives for compensating for the “use” of knowledge by apportioning property rights. Still others suggest legislative prescriptions to the participation in the consultative process. All of these are attempts at strengthening consultative mechanisms to better manage and negotiate procedures for use of market based instruments, as well as promoting legislative changes for better environmental outcomes. Managed consultative mechanism is the focus of this paper, as the question being addressed is how best can the consultative mechanisms be managed?

The first part of the paper highlights fallacy of composition involved when challenges imposed by human impacts on the environment are enriched applying knowledge systems. It acknowledges that there will be limits to knowledge irrespective of the extent of their use in enriching environmental decisions. The second part of the paper calls for a recognition of the complexity involved in aggregation of different knowledge bases. It is based on identification that knowledge systems are dynamic in content and are context driven. As a result of evolutionary nature of knowledge systems the main concern relates to representation. The third part of the paper discusses the importance of better understanding of the context in which knowledge is generated. The paper concludes with a plea for a better design and adaptation of the precautionary principle in a risk and uncertain environment surrounding knowledge systems.

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A handwritten signature in black ink, appearing to read "K. D. Reiter", with a long horizontal flourish extending to the right.

Dr. Kimberly D. S. Reiter
Conference Chair