

SEI U.S. CENTER

ANNUAL REPORT
2011





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INTRODUCTION

The Stockholm Environment Institute is an international not-for-profit research organization that has been engaged in environment and development issues at local, national, regional and global policy levels for more than 20 years. Our goal is to bring about change for sustainable development by bridging science and policy. We do this by conducting integrated analysis that supports decision-makers.

SEI’s work is interdisciplinary in nature, drawing upon engineering, economics, ecology, ethics, operations research, international relations and software design. We work all around the world building capacity for integrated sustainability planning through training and collaboration on projects.

SEI is headquartered in Stockholm, Sweden, and has six additional centers around the world. SEI’s U.S. Center, an independent 501c-(3) nonprofit corporation, is a research affiliate of Tufts University in Massachusetts and also has offices in Davis, California, and Seattle, Washington.

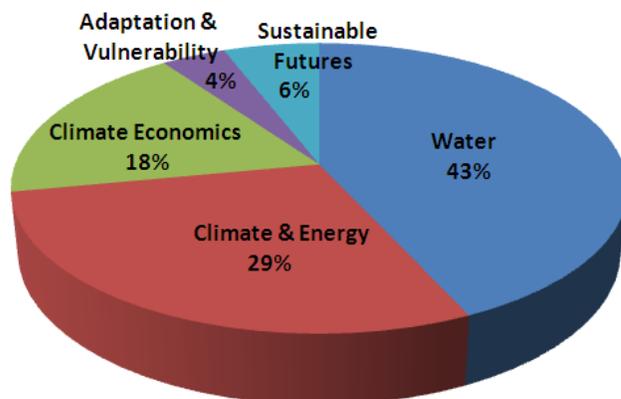
2011 OVERVIEW

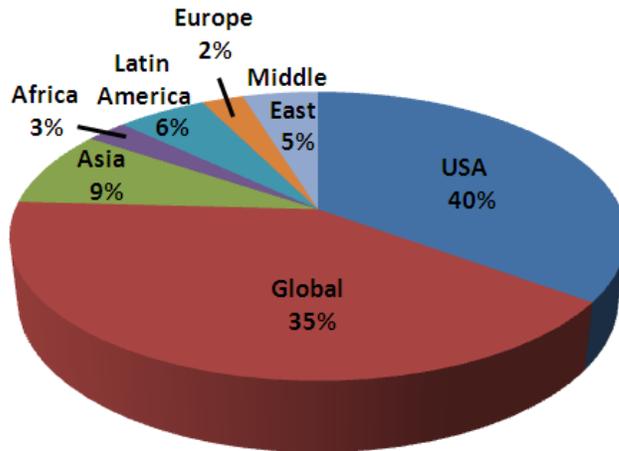
SEI-US completed its sixth year of operation in 2011, and continued to strengthen its core research efforts in water and energy resource management, climate mitigation policy, climate economics, climate equity, and general sustainability issues. A full-time research position in Adaptation and Vulnerability was also added to complement the existing research themes in 2011, thus realizing a key objective identified in the Strategic Plan developed in 2009.

SEI-US FINANCES IN 2011

SEI-US ended the fiscal year with \$3,392,279 million in revenue, slightly higher than for fiscal 2010, and a net change in assets of \$33,246. Breakdowns of revenue by programmatic areas and geographic regions are provided graphically below. The ratio of available cash reserves to monthly expenses remained at a satisfactory value of approximately 5.0 during 2011, where it has been since the third quarter of 2009, indicating the continuation of a stable cash flow situation for the organization.

Funding by program



Funding by region

SEI-US researchers continued to procure substantial (approximately \$560,000) contract and grant awards through U.S. federal funding mechanisms, and SEI was notified in November 2011 that it would be the recipient of its first award through the Development Grants Program of USAID. This grant of \$531,000, to be obligated in 2012, will allow substantial new research efforts to begin in the area of water resource vulnerability to climate change in Colombian watersheds. With regard to federal compliance and fiduciary responsibility, SEI-US successfully completed its fourth A-133 single audit as a component of its overall annual financial reporting.

The sections that follow describe SEI-US' seven research programs and their major projects in 2011. A final section lists all publications produced by SEI-US staff during the year.

RESEARCH PROGRAMS

Water Resources

Contact: David R. Purkey, david.purkey@sei-us.org
<http://sei-us.org/WaterResources>

In recent years, the issue of the long-range adequacy of fresh water resources has moved to center stage in international discussions of sustainable development. The call for the adoption of sustainable water strategies has become urgent as conflicts over the allocation of increasingly scarce water resources loom. Sustainable water management requires a systemic perspective that links water resources to requirements for irrigation, industry, human needs and ecosystems.



SEI-US has actively sought to heighten awareness of freshwater problems and to develop appropriate strategies for living within water budgets in a sustainable manner. The SEI-US Water Resources team advances integrated approaches to freshwater assessment and policy. The team works throughout the US, Central and South America and the Caribbean, the Middle East, Africa and Asia.

We work in five main areas:

- **Methods for Integrated Water Analysis:** SEI's WEAP (Water Evaluation And Planning) system, a transparent and user-friendly decision-support tool for engaging stakeholders, provides a unique framework for water assessment and planning.
- **Capacity Building:** WEAP is widely disseminated to water analysts throughout the world in both governmental and NGO settings, and SEI-US runs workshops on integrated water planning with WEAP as a conceptual framework and practical approach.
- **Modeling Climate Change Impacts on Water Resources:** SEI-US uses WEAP to quantify climate-change driven impacts to water resource allocation.
- **River Basin Assessments:** Working with local counterparts, SEI-US provides comprehensive assessments of water and environment in watersheds around the globe.
- **Global Water Futures:** SEI-US has been at the forefront of analyzing global freshwater conditions, preparing alternative water scenarios including developing and modeling agricultural adaptation strategies to climate change, and setting priorities for action.

Selected Projects in 2011

Economic Assessment of Climate Change Linking WEAP to an Agricultural Production Model

Staff: Purkey, D.; Forni, L.; Joyce, B.; Sieber, J.

Date: 2011-ongoing

Description: SEI is collaborating with the University of California–Davis to link an agricultural production model based on water valuation for irrigation water, SWAP (State Wide Agricultural Production Model), with SEI's WEAP (Water Evaluation and Planning System). The model is used for an economic assessment of climate change for the entire Central Valley in California under three land changes scenarios of agricultural land based on population growth projections. The outcome of this work is a series of climate change and population projections to 2100.

Urban Metabolic Mapping: Securing the Biophysical Foundation of Indian Cities (cross-posted)**Staff:** Mehta, V.; Kemp-Benedict, E.; Briggs, J.; Wang, D.**Date:** 2011-ongoing**Client/Funder:** SEI IPS funds**Research Area(s):** Water Resources; Sustainable Futures

Description: The objective of this project is to develop a systems perspective of energy, water and material flows in Indian cities, and to provide information and deliberative modeling to the public via a geospatial web-based service. In collaboration with Indian Institute of Management and the Indian Institute of Science, Bangalore, the researchers seek to understand and communicate the socio-economic drivers of consumption in Indian cities.

Developing Climate Risk Management Strategies for Water Utilities**Staff:** Purkey, D.; Fencel, A.; RAND Corporation; Hazen and Sawyer**Date:** 2010-ongoing**Client/Funder:** Water Research Foundation

Description: Climate change adds a layer of complexity to the already substantial challenges facing water utility managers. As future conditions become increasingly uncertain, decision processes responding to these changes are necessarily evolving away from a deterministic prediction-based paradigm to one based on vulnerability identification and adaptation planning. SEI is developing a risk assessment and management framework for water utilities to help them learn about potential climate impacts and how these affect decision-making and planning. The framework will be piloted for the New York City water supply system and with the Colorado Springs Utilities in 2011.

Statewide Integrated Water and Energy Planning in California (cross-posted)**Staff:** Purkey, D.; Joyce, B.; Sieber, J.; Heaps, C.; National Center for Atmospheric Research; Pacific Gas and Electric Company; Lawrence Berkeley National Laboratory**Date:** 2010-ongoing**Client/Funder:** National Oceanic and Atmospheric Administration (NOAA); California Energy Commission (CEC)**Research Area(s):** Water Resources; Energy Modeling

Description: This project continues to link SEI's Water Evaluation and Planning (WEAP) and Long-range Energy Alternatives Planning (LEAP) systems to build an integrated platform to explore water and energy interactions and feedbacks. In California, it is estimated that nearly 20% of all energy is associated with moving, lifting, treating, and using water. For this project, SEI has partnered with the state Department of Water Resources, which is responsible for guiding California's water future; the California Energy Commission, the coordinating agency to address climate change and reduce greenhouse emissions; and the Pacific Gas and Electric Company (PG&E), which provides natural gas and electric service to millions in northern and central California. We will link water management options, such as reuse, reservoir re-operation, demand-side management, land use changes, etc., as represented in the WEAP portion of the tool, to models of the electric utility serving the water utilities, as represented in LEAP. In addition to a new decision support tool, the results of this case study will be used to develop a final report on the Northern California's water future and its implications for energy demands.

Integrating Economic Optimization Considerations into California Water Planning**Staff:** Purkey, D.; Forni, L.; University of California–Davis**Date:** 2010-ongoing**Client/Funder:** U.S. Bureau of Reclamation**Description:** SEI, in collaboration with University of California–Davis, is developing a link between the WEAP application for the Sacramento Basin, San Joaquin Valley and the Tulare Lake hydrology and SWAP, the State Wide Agricultural Production model for the Central Valley. The study dynamically simulates the relationships between water supply and land use management decisions under a number of climate change scenarios.**Improving Water Productivity and Reducing Water-Related Conflict in the Andes****Staff:** Purkey, D.; Escobar, M.; Universidad Nacional de Colombia Sede Palmira; World Wildlife Fund-Colombia; King’s College-London**Date:** 2010-ongoing**Client/Funder:** Climate Program on Water and Food (CPWF), Consultative Group on International Agricultural Research (CGIAR)**Description:** SEI implemented a dynamic link between WEAP (developed by SEI) and the FIESTA (AguaAndes) model to provide information on water availability, demands, and management systems. The project is implemented in five watersheds in collaboration with local stakeholders actively participating in water resources negotiations.**Mekong Futures Project – Northeast Thailand** (cross-posted)**Staff:** Kemp-Benedict, E.; Mikhail, M.; Krittasudthacheewa, C. (SEI Asia); Polpanich, O. (SEI Asia); University of Khon Kaen, CSIRO**Date:** 2010-ongoing**Client/Funder:** Commonwealth Scientific and Industrial Research Organization (CSIRO), Australian Agency for International Development (AusAID)**Research Area(s):** Sustainable Futures; Water Resources**Description:** This project is a component in a larger AusAID and CSIRO-funded project on Mekong Futures. The study will apply multiple-objective planning methods to construct an integrated framework for supporting decision-making for sustainable livelihoods in Northeast Thailand. As the most impoverished agricultural region, NE Thailand has been a top priority for national development schemes, which have improved household living standards dramatically. Despite this achievement, household incomes in the region continue to depend heavily on agricultural commodities, while continually increasing energy and food demands are driving a marked change of land-use. The project team will engage with the existing decision-making process of River Basin Authorities to provide decision support in exploring long-term trends, challenges, and opportunities for the region.

Energy Modeling

Contact: Charlie Heaps, charlie.heaps@sei-us.org
<http://sei-us.org/EnergyModeling>

SEI's energy modeling activities are focused on the development, support and application of LEAP: the Long range Energy Alternatives Planning System, a software tool for energy policy analysis and climate change mitigation assessment used by thousands of organizations in more than 190 countries.

We work in three main areas:

- **LEAP Development and Support:** LEAP has been used at many different scales – from cities and states to national, regional, even global applications – for integrated resource planning and greenhouse gas mitigation assessments.
- **Scenario Studies:** In addition to developing LEAP and supporting LEAP users, we also apply LEAP in a wide variety of energy scenario studies – most recently in a global energy assessment.
- **Capacity and Community Building:** SEI is the founder and manager of COMMEND (COMMunity for ENergy environment & Development) an international initiative designed to foster a community among energy analysts working on energy for sustainable development.



Selected Projects in 2011

Statewide Integrated Water and Energy Planning in California (cross-posted)

Staff: Purkey, D.; Joyce, B.; Sieber, J.; Heaps, C.; National Center for Atmospheric Research; Pacific Gas and Electric Company; Lawrence Berkeley National Laboratory

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Client/Funder: National Oceanic and Atmospheric Administration (NOAA); California Energy Commission (CEC)

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Global Energy Assessment for Rio+20 (cross-posted)

Staff: Nilsson, M.; Heaps, C.; Erickson, P.; Persson, A.; Carson, M.; The Energy and Resources Institute (TERI); World Resources Institute (WRI); International Institute for Applied Systems Analysis (IIASA); PBL Netherlands Environmental Assessment Agency

Date: 2011-2012

Client/Funder: Sida, Swedish government

Research Area(s): Energy Modeling; Climate Mitigation Policy

Description: Feeding into the Rio+20 preparations, SEI, together with its partners around the world, prepared a global assessment on the United Nations goal of providing "sustainable energy for all". Access to energy for the poor is widely regarded as key to making advances towards the UN's Millennium Development Goals. This study examined the implications of "energy for all" going beyond basic access and instead supporting development more fundamentally by providing electricity and modern fuels for productive uses all around the world. The resulting assessment describes viable pathways for achieving these goals, and suggests how a greening of economic and energy development pathways might be governed across different scales.

LEAP Energy Model for Massachusetts Global Warming Solutions Act (GWSA)

Staff: Heaps, C.; Clark, V.

Date: 2010-2011

Description: The Massachusetts Global Warming Solutions Act (GWSA) requires the Commonwealth of Massachusetts to achieve GHG reductions of 80% by 2050. The state asked SEI to develop a new energy and climate mitigation model to examine what policies can best meet these targets. SEI used the LEAP model to create baseline emissions projections to 2020 and 2050 and also analyzed more than 50 different policies and measures that could be implemented to achieve these goals. These measures include major energy efficiency and technical measures such as the electrification of transport and deep energy efficiency retrofits of buildings as well as dramatic shifts in how the state might generate carbon-free electricity. The model results informed the Massachusetts Clean Energy and Climate Plan for 2020.

Climate Economics

Contact: Frank Ackerman, frank.ackerman@sei-us.org
<http://sei-us.org/ClimateEconomics>

The scientific evidence for climate change is ominous and compelling, but conventional economic analysis has fueled new arguments against vigorous, near-term climate policy initiatives. A handful of widely cited economic models and analyses assert that climate-change mitigation would be impossibly expensive, reinforcing widespread cynicism about the cost of government initiatives. Our own research implies that some of those models are deeply flawed and built on questionable assumptions – but there’s a need for a robust body of work to counter them.



Alternative economic analyses can also add new perspectives, considering equity questions, for example, that are often ignored in conventional economic models. This is the focus of our research.

The Climate Economics Group at SEI-US plays a unique role in the analysis of climate change and the development of climate policy. Our goal is to create a rigorous, science-based, and accessible economic analysis that demonstrates the urgency and feasibility of large-scale solutions to the climate crisis.

Our current research focuses on three key areas:

- **Visualizing Climate Impacts:** An important part of our work is to help create a picture of climate impacts and their economic meaning, in terms the public can understand, including both qualitative description and quantitative estimates.
- **Understanding Climate Policy:** We seek to provide sensible economic analysis of proposed regulations and legislation, with a focus on U.S. policy. Recent work has focused on cap-and-trade programs, coal-ash regulations, and the “social cost of carbon”.
- **Sharing Climate Costs:** Unequal impacts and differing levels of responsibility make ethical questions central to climate policy. Our work looks closely at equity issues in climate economics, challenging the traditional notion that equity and efficiency can each be analyzed in isolation.

Selected Projects in 2011

Climate Impact Equity Lens (CIEL)

Staff: Stanton, E.A.; Bueno, R.; Davis, M.

Date: 2011-12

Client/Funder: SEI Research Innovation Fund (NOVA)

Description: Large-scale climate impacts, with losses in the billions or trillions of dollars, may be hard to visualize. How will climate change affect you as an individual? Using a new methodology, the CIEL model calculates the net gains and losses for typical individuals resulting from a global failure to abate greenhouse-gas emissions. Results are compared for individuals facing low, medium and high damages in high-income and low-income countries. Some of the most important choices that underpin economic assessments of potential climate policies are based not on science, but on normative beliefs; CIEL approaches these choices as important information for policymakers and the public at large, and presents

results for multiple values of each key assumption. Case studies will apply CIEL to the Caribbean, which faces extreme climate risks, and to the United States.

Modeling Risk in Climate Economics

Staff: Ackerman, F.; Stanton, E.A.; Bueno, R.

Date: 2011-2012

Client/Funder: Litterman Family Foundation

Description: Climate change involves uncertain probabilities of catastrophic risks, and very long-term consequences of current actions. Climate economics, therefore, is centrally concerned with the treatment of risk and time. Yet conventional assumptions about utility and optimal economic growth create a perverse connection between risk aversion and time preference, such that more aversion to current risks implies less concern for future outcomes, and vice versa. SEI set out to address this problem, adopting methods from the economics of finance. The result was a working paper now submitted to a journal.

San Francisco Consumption-Based Emissions Inventory (CBEI)

Staff: Stanton, E.A.; Bueno, R.; Cegan, J.; Au, D.; Ackerman, F.

Date: 2011

Description: In this project, which builds on previous work in Oregon and King County, WA, SEI-US will produce Consumption-Based Emissions Inventory (CBEI) results for San Francisco County and for the State of California. CBEI estimates the total greenhouse gas emissions resulting from all consumption within a study area. For this project, two study areas will be analyzed: (1) the City and County of San Francisco, and (2) the State of California. For this study emissions will be broken down by 1) emissions from households, government and business investments; 2) emissions released within the study area, outside of the study area but within the United States, and in foreign countries; 3) life-cycle phase (production, pre-purchase transportation, wholesale/retail, use, post-consumer disposal); and 4) 400-500 types of consumer goods and services that aggregate to a few dozen subcategories and approximately 15 categories.

Employment effects of coal ash regulations

Staff: Ackerman, F.; Bueno, R.

Date: 2011

Client/Funder: Earthjustice

Description: The U.S. Environmental Protection Agency is considering regulation to protect the public from the health hazards of coal ash disposal. In response, an industry group has claimed that strict regulation of ash disposal could lead to the loss of more than 300,000 jobs. SEI analyzed the group's calculations and found fundamental flaws in that claim – most notably, that it provides no explanation for more than 50,000 purportedly lost jobs, and that the majority of the claimed job loss, said to be the result of a 1% increase in electricity prices, is based on misuse of an estimate in an unpublished academic paper.

Regulation of Cooling Water Intake Structures at Existing Facilities

Staff: Ackerman, F.; Stanton, E.

Date: 2011

Client/Funder: Riverkeeper

Description: The U.S. Environmental Protection Agency has proposed requirements under the Clean Water Act for cooling water intake structures at existing power generation and manufacturing facilities that withdraw more than 2 million gallons per day of water. SEI prepared comments, submitted as

testimony to the EPA, that review a cost-benefit analysis done by the EPA of four regulatory options and discuss the agency's use of the cost-benefit framework in the regulatory process. They offer more complete estimates of benefits, look more closely at projected electricity market and employment impacts, and identify problems with non-monetizable values that make cost-benefit analysis less useful in this context. In addition, they argue against the EPA's recommendation of site-specific decisions, which would shift the burden of cost-benefit analysis onto individual states.

How Much Are the Oceans Worth? Assessing the Economic Value of Oceans and the Cost of Inaction

Staff: Ackerman, F.; Stanton, E.A.; Davis, M.

Date: 2010-12

Description: Despite oceans' enormous importance, scant attention has been given to them in climate policy. We now realize oceans face several threats, including rising temperatures, acidification, pollution, and large regions that have become anoxic. Coastal areas are also threatened by sea-level rise. This project, part of an international, multi-disciplinary effort led by SEI, takes a holistic approach to those issues and provides estimates of their economic impacts and implications. Our research will examine the economic cost of climate impacts on marine fishing, tourism and recreation, coastal property and infrastructure, and other industries.

Turning the World Economic and Social Survey 2009 into a book

Staff: Ackerman, F.; Davis, M.

Date: 2011

Client/Funder: UN Department of Economic and Social Affairs

Description: SEI, a significant contributor to the United Nations Department of Economic and Social Affairs' World Economic and Social Survey 2009: Promoting Development, Saving the Planet, was asked to edit and update the report for publication as a book in 2012, with a new preface by SEI's Frank Ackerman. This book spells out, in more detail than usual, what can and should be done to avert the real risks of climate change-related disaster. It summons world leaders to an endeavor worthy of the resources and ingenuity of the twenty-first century, to bold initiatives with big costs – and much bigger benefits.

Climate Economics: The State of the Art

Staff: Ackerman, F.; Stanton, E.A.; Davis, M.; Fitzgerald, E.; Cegan, J.

Date: 2011

Client/Funder: WWF-US

Description: Economic analysis has become increasingly central to the climate policy debate, but the models and assumptions of climate economics often lag far behind the latest developments in this fast-moving field. SEI conducted an in-depth review of new developments in climate economics and science since the *Stern Review* (2006) and the Intergovernmental Panel on Climate Change's *Fourth Assessment Report* (2007), producing a report with more than 500 citations.

The Social Cost of Carbon

Staff: Ackerman, F.; Davis, M.; Stanton, E.A.; Au, D.; Charles Munitz

Date: 2010-2011

Client/Funder: E3 Network

Description: The social cost of carbon (SCC), defined as the estimated price of the damages caused by each additional ton of CO₂ released into the atmosphere, is the volume dial on government regulations

affecting greenhouse gases: The higher the SCC is set, the more stringent the regulatory standards. It is used in cost-benefit analyses of proposed rules by EPA and other regulatory agencies. This project builds on our 2010 critique of the federal government process that recommended a low value of \$21 per ton of CO₂; our follow-up analysis looks at two of the models used to come up with that estimate, FUND and DICE. We will also recalculate the SCC, using the methods of the federal government's analysis but incorporating a full range of climate risks and uncertainties.

Climate and Regional Economics of Development (CRED)

Staff: Ackerman, F.; Bueno, R.; Stanton, E.A.

Date: 2009-ongoing

Description: SEI's Climate and Regional Economics of Development (CRED) is an integrated assessment model, with a central focus on the global distribution of climate damages and climate policy costs. It is designed to estimate both the best pace of investment in mitigation, and the best distribution of the cost of that investment to regions of the world. Our goal is to inform global climate negotiations and help break the stalemate between developed and developing countries. In 2011 we continued to enhance the CRED model, to enable it to provide projections of costs, benefits, climate impacts, and investment needs at a sub-regional level. We are also exploring options for incorporating new approaches to risk and uncertainty into CRED, based on recent developments in the economic theory of climate change.

King County Greenhouse Gas Emissions Inventories and Tracking Framework (cross-posted)

Staff: Erickson, P.; Lazarus, M.; Stanton, E.A.; Chandler, C.; Bueno, R.; Ackerman, F.; Kollmuss, A.; Cascadia Consulting Group Inc.; Gordon Smith, Ecofor LLC; Michael Gillenwater

Date: 2010-2011

Client/Funder: King County (WA), City of Seattle, Puget Sound Clean Air Agency

Research Area(s): Climate Mitigation Policy, Climate Economics

Description: In the absence of an accepted, standard greenhouse gas inventory protocol for communities, King County and other partners have funded this ambitious project to recommend a GHG emissions monitoring framework for the region of King County (which includes Seattle). SEI's work on this project has included compiling a 2008 update to the County's GHG emissions inventory (using traditional inventory methods) as well as conducting an innovative consumption-based GHG inventory (counting all the emissions released to support consumption in the county, regardless of where those emissions were released). Using results of these two inventories, coupled with additional research, SEI has been working with King County and other project partners to recommend a comprehensive, policy-relevant, cost-effective emissions measurement framework.

Western Water, Climate Change, and the Costs of Inaction

Staff: Ackerman, F.; Stanton, E.A.; Fitzgerald, E.; Davis, M.; Synapse Energy Economics (J. Fisher), J. Balasubramanian

Date: 2009-2011

Client/Funder: Kresge Foundation

Description: Several Western U.S. states are rapidly running out of water, and climate change is exacerbating the problem. This study analyzed the interactions of climate change with water, agriculture, and energy in the West and Southwest, making projections through the year 2100, with a special focus on California and less-detailed analyses for other states. Issues considered included increasing heat, a decline in snowfall and thus snowmelt, and competing demands for water for urban areas, irrigation, power generation, and environmental needs.

Climate Mitigation Policy

Contact: Michael Lazarus, mlaz@sei-us.org
<http://sei-us.org/ClimateMitigation>

Avoiding dangerous climate change requires ambitious actions to deeply reduce greenhouse gas emissions at the international, national, and local community levels. At each of these levels, SEI-US informs, supports and advises decision-makers and civil society on possible pathways to an equitable, low-carbon future.

In addition to activities specifically related to energy modeling, climate economics, emissions trading, and equity, SEI-US:



- Provides analytical support and facilitation to regional and local policymakers and stakeholders in the development of climate action plans, in the design of emission trading systems, and in the establishment of technical capacity. For example, SEI-US has provided technical support to several U.S. states, including Washington and Massachusetts; to numerous developing countries, and to regional programs such as the Western Climate Initiative.
- Conducts low-carbon scenario studies that outline pathways to deep emission reductions, such as the recent Carbon Neutral Seattle and Europe's Share of the Climate Challenge studies.
- Develops methods for emissions accounting and assesses policies and measures such as domestic and international offset protocols (e.g. the Clean Development Mechanism), emissions benchmarking, and comprehensive emissions tracking frameworks that take both consumption and production into account.
- Develops tools to better assess the life cycle impact of energy projects (e.g. woody biomass energy).

Selected Projects in 2011

A tool for better understanding the climate impacts of energy production from woody biomass
 (cross-posted)

Staff: Lee, C.; Lazarus, M.

Date: 2011-ongoing

Client/Funder: Natural Resources Defense Council

Research Area(s): Climate Mitigation Policy; Emissions Trading & Offsets

Description: Backed by numerous national and global studies, climate and renewable energy experts and advocates have long pointed to biomass energy as offering a potentially significant contribution to long-term, sustainable energy supply. However, in several regions of the United States, proposals to build new biomass power plants have met with stiff opposition, with questions raised regarding the climate benefit of woody biomass energy production. To help address these questions, SEI is developing a spreadsheet tool capable of assessing and clearly presenting the timeline of climate impacts, both GHG emissions and climate-forcing, of using a range of woody biomass sources for electricity production, building upon the foundation of the Land-Use Change Emissions (LUCE) model developed by SEI with NRDC support. Our overall objective with this effort is to develop an educational tool that can inform ongoing biomass energy discussions at both at the government agency level and with civil society at large, and through

doing so, achieve greater consensus on the role of U.S. biomass energy in mitigating global climate change.

Study on the Integrity of the Clean Development Mechanism (CDM) (cross-posted)

Staff: Lazarus, M.; Erickson, P.; Chandler, C.; AEA (lead), Centre for European Policy Studies, CO2logic

Date: 2011-ongoing

Client/Funder: European Commission Directorate-General for Climate Action, AEA

Research Area(s): Emissions Trading & Offsets; Climate Mitigation Policy

Description: SEI is part of a team led by AEA, a global sustainability consultancy, that is providing the European Union with a comprehensive appraisal of the strengths and shortcomings of the Clean Development Mechanism (CDM) and a suite of practical reform options. We are examining systemic reforms that the EU could promote through changes in CDM governance, rules, and operation as well as unilateral demand-side" steps that the EU, as the principal market for certified emission reductions (CERs), could take to leverage change.

Global Energy Assessment for Rio+20 (cross-posted)

Staff: Nilsson, M.; Heaps, C.; Erickson, P.; Persson, A.; Carson, M.; The Energy and Resources Institute (TERI); World Resources Institute (WRI); International Institute for Applied Systems Analysis (IIASA); PBL Netherlands Environmental Assessment Agency

Date: 2011-2012

Client/Funder: Sida, Swedish government

Research Area(s): Energy Modeling; Climate Mitigation Policy

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3C: Enabling the Development of Technologies Required to Reach a Low-Carbon Economy

Staff: Erickson, P.; Lazarus, M.; Chandler, C.; Varnäs, A.; Nykvist, B.; Nilsson, M. (SEI-Stockholm)

Date: 2011-ongoing

Client/Funder: 3C – Combat Climate Change

Description: This study, part of SEI's broader 3C program partnership, focuses on the necessary requirements for key low-carbon technologies to be developed and commercialized; the various structures, policies and other incentives needed to enable this development; as well as the incentives that would spur companies to move to and invest in these new technologies. We focus our study on solar photovoltaic and carbon capture and storage (CCS) technologies in the United States and Europe.

Updating the UNFCCC training materials on climate change mitigation

Staff: Heaps, C.; Chandler, C.; Clark, V.

Date: 2011-2012

Client/Funder: UNFCCC Secretariat

Description: As part of its mandate to support the work of the Consultative Group of Experts (CGE) on national communications from Parties not included in Annex I to the Convention, the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) provides materials for CGE hands-on training workshops. SEI was hired as a consultant to update training materials to support the implementation of the work program of the CGE relating to the provision of technical assistance on programs containing measures to mitigate climate change. As a follow-up, SEI also hosted three regional workshops based on the materials, in Thailand, Antigua and Barbuda, and Ghana, each attended by participants from roughly 30-40 developing countries.

Low-Greenhouse-Gas Consumption Strategies and Impacts on Developing Countries

Staff: Erickson, P.; Dawkins, E.; Owen, A.

Date: 2011-2012

Client/Funder: SEI Nova funds

Description: A growing body of research shows how shifts in consumer behavior could lead to reductions in greenhouse gas (GHG) emissions. By buying fewer goods, especially high-GHG items, and redirecting any spending to low-GHG alternatives, consumers could help reduce emissions. This project aimed to quantify some of the distributional aspects of low-GHG consumption by tracing the economic impacts of the WRAP scenario for the UK through the global supply chain. The findings indicate that lower-income countries could be disproportionately affected by low-GHG consumption in industrialized countries, suggesting that greater efforts need to be made to embed development considerations in efforts to reduce emissions from consumption in high-income countries, such as helping low-income countries reduce the GHG-intensity of production.

Methodology for Scenario Analyses of Low-GHG Consumption

Staff: Erickson, P.; Chandler, C.; Lazarus, M.

Date: 2011-2012

Client/Funder: SEI-US Core Funds

Description: In recent years, climate policy analysts have explored the links between consumption patterns and greenhouse gases (GHGs) by developing methods to estimate life-cycle emissions associated with different categories of consumption, e.g., a carbon "footprint". However, surprisingly few studies have attempted to construct long-term scenarios of how far shifts in consumption patterns could reduce GHG emissions. Most scenarios constructed by the Intergovernmental Panel on Climate Change (IPCC), the International Energy Agency, and other organizations primarily focus on emissions associated with the sectors (e.g. industry, buildings, transportation, agriculture) that produce emissions, not the types of consumers (and associated products) that demand them. The goal of this project was to create, document, and pilot a methodology for constructing long-term scenarios of the GHG emissions associated with consumption.

King County Greenhouse Gas Emissions Inventories and Tracking Framework (cross-posted)

Staff: Erickson, P.; Lazarus, M.; Stanton, E.A.; Chandler, C.; Bueno, R.; Ackerman, F.; Kollmuss, A.; Cascadia Consulting Group Inc.; Gordon Smith, Ecofor LLC; Michael Gillenwater

Date: 2010-2011

Client/Funder: King County (WA), City of Seattle, Puget Sound Clean Air Agency

Research Area(s): Climate Mitigation Policy, Climate Economics

Description: In the absence of an accepted, standard greenhouse gas inventory protocol for communities, King County and other partners have funded this ambitious project to recommend a GHG emissions

monitoring framework for the region of King County (which includes Seattle). SEI's work on this project has included compiling a 2008 update to the County's GHG emissions inventory (using traditional inventory methods) as well as conducting an innovative consumption-based GHG inventory (counting all the emissions released to support consumption in the county, regardless of where those emissions were released). Using results of these two inventories, coupled with additional research, SEI has been working with King County and other project partners to recommend a comprehensive, policy-relevant, cost-effective emissions measurement framework.

Scenarios for a Carbon Neutral Seattle

Staff: Lazarus, M.; Erickson, P.; Chandler, C.; Kollmuss, A.; Cascadia Consulting Group Inc.; ICF International

Date: 2010-2011

Client/Funder: City of Seattle

Description: The City of Seattle has announced an intention to become a "carbon neutral" city. SEI worked with the city's Office of Sustainability and Environment to define what "carbon neutrality" might mean for a community and then developed alternative scenarios for how Seattle might attain such an ambitious goal. The work involved developing baseline forecasts of Seattle's emissions growth out to 2050, exploring alternative definitions of carbon neutrality, assessing the relative spheres of influence of city government and other community stakeholders, and developing deep reduction scenarios.

Opportunities for Standardization of International Offset Mechanisms (cross-posted)

Staff: Lazarus, M.; Lee, C.; Chandler, C.; Erickson, P.; Kollmuss, A.

Date: 2010-2011

Client/Funder: U.S. Environmental Protection Agency

Research Area(s): Climate Mitigation Policy; Emissions Trading & Offsets

Description: The Clean Development Mechanism (CDM) is at a crossroads, and numerous stakeholders are calling for its reform. SEI is working with the U.S. Environmental Protection Agency and a team from Perspectives Inc. and the University of Zurich to advance thinking for the next phase of international mitigation activities. We are examining opportunities and challenges in applying performance standard approaches internationally, as well as opportunities for further standardization of specific project types. We are also assessing the extent to which performance-based additionality tests could enhance (or degrade) the environmental integrity of offset programs by examining potential outcomes for selected CDM projects.

Road-testing Improved Forest Management Offset Protocols (cross-posted)

Staff: Lee, C.; Smith, G.; Carney, K.

Date: 2010-2011

Research Area(s): Emissions Trading & Offsets; Climate Mitigation Policy

Description: This research compares the draft U.S. Environmental Protection Agency Climate Leaders forest management protocol with protocols from four other offset programs: the American Carbon Registry (ACR), the Climate Action Reserve, the Chicago Climate Exchange (CCX), and the Verified Carbon Standard (VCS). We road-test these protocols for four sample projects that vary by project location and starting carbon stock levels to reveal why protocols differ in the number of offsets generated from the same sample project.

Bioenergy, sustainability and trade-offs: Can we avoid deforestation while promoting bioenergy?

(cross-posted)

Staff: Kemp-Benedict, E.; Lee, C.; Resende, F.; Hammerschlag, R.; Johnson, F. and Tella, P. (SEI Stockholm); Center for International Forestry Research; Council for Scientific and Industrial Research; Universidad Nacional Autónoma de México, Joanneum Research

Date: 2009-2011

Client/Funder: European Commission

Research Area(s): Climate Mitigation Policy; Sustainable Futures

Description: SEI staff collaborated with the CGIAR Center for International Forestry Research (CIFOR), CSIR, Joanneum Research, and UNAM to assess the potential impacts of bioenergy production on forests and forest derived livelihoods. The work was carried out with CIFOR's Trade & Investment group and focused on biofuel production for international markets. SEI and its collaborators assessed the potential impacts of bioenergy production on forests and forest-based livelihoods. The work focused on biofuel production for international markets. SEI developed and facilitated global and regional scenario exercises, and built on a previous SEI collaboration with CIFOR.

Emissions Trading & Offsets

Contact: Michael Lazarus, mlaz@sei-us.org

<http://sei-us.org/EmissionsTrading>

Avoiding dangerous climate change requires ambitious actions to deeply reduce greenhouse gas emissions at the international, national, and local community levels. At each of these levels, SEI-US informs, supports and advises decision-makers and civil society on possible pathways to an equitable, low-carbon future.

In addition to climate mitigation activities specifically related to energy modeling, climate economics, emissions trading, and equity, SEI-US:



- Provides analytical support and facilitation to regional and local policymakers and stakeholders in the development of climate action plans, in the design of emission trading systems, and in the establishment of technical capacity. For example, SEI-US has provided technical support to several U.S. states, including Washington and Massachusetts; to numerous developing countries, and to regional programs such as the Western Climate Initiative.
- Conducts low-carbon scenario studies that outline pathways to deep emission reductions, such as the recent Carbon Neutral Seattle and Europe's Share of the Climate Challenge studies.
- Develops methods for emissions accounting and assesses policies and measures such as domestic and international offset protocols (e.g. the Clean Development Mechanism), emissions benchmarking, and comprehensive emissions tracking frameworks that take both consumption and production into account.
- Develops tools to better assess the life cycle impact of energy projects (e.g. woody biomass energy).

*Selected Projects in 2011***A tool for better understanding the climate impacts of energy production from woody biomass** (cross-posted)**Staff:** Lee, C.; Lazarus, M.**Date:** 2011-ongoing**Client/Funder:** Natural Resources Defense Council**Research Area(s):** Climate Mitigation Policy; Emissions Trading & Offsets**Description:** Backed by numerous national and global studies, climate and renewable energy experts and advocates have long pointed to biomass energy as offering a potentially significant contribution to long-term, sustainable energy supply. However, in several regions of the United States, proposals to build new biomass power plants have met with stiff opposition, with questions raised regarding the climate benefit of woody biomass energy production. To help address these questions, SEI developed a spreadsheet tool to assess and clearly present the timeline of climate impacts, both GHG emissions and climate-forcing, of using a range of woody biomass sources for electricity production, building upon the foundation of the Land-Use Change Emissions (LUCE) model developed by SEI with NRDC support.**Study on the Integrity of the Clean Development Mechanism (CDM)****Staff:** Lazarus, M.; Erickson, P.; Chandler, C.; AEA (lead), Centre for European Policy Studies, CO2logic**Date:** 2011-ongoing**Client/Funder:** European Commission Directorate-General for Climate Action, AEA**Research Area(s):** Emissions Trading & Offsets; Climate Mitigation Policy**Description:** SEI is part of a team led by AEA, a global sustainability consultancy, that is providing the European Union with a comprehensive appraisal of the strengths and shortcomings of the Clean Development Mechanism (CDM) and a suite of practical reform options. We are examining systemic reforms that the EU could promote through changes in CDM governance, rules, and operation as well as unilateral demand-side" steps that the EU, as the principal market for certified emission reductions (CERs), could take to leverage change.**Opportunities for Standardization of International Offset Mechanisms** (cross-posted)**Staff:** Lazarus, M.; Lee, C.; Chandler, C.; Erickson, P.; Kollmuss, A.**Date:** 2010-2011**Client/Funder:** U.S. Environmental Protection Agency**Research Area(s):** Climate Mitigation Policy; Emissions Trading & Offsets**Description:** The Clean Development Mechanism (CDM) is at a crossroads, and numerous stakeholders are calling for its reform. SEI is working with the U.S. Environmental Protection Agency and a team from Perspectives Inc. and the University of Zurich to advance thinking for the next phase of international mitigation activities. We are examining opportunities and challenges in applying performance standard approaches internationally, as well as opportunities for further standardization of specific project types. We are also assessing the extent to which performance-based additionality tests could enhance (or degrade) the environmental integrity of offset programs by examining potential outcomes for selected CDM projects.

Road-testing Improved Forest Management Offset Protocols (cross-posted)

Staff: Lee, C.; Smith, G.; Carney, K.

Date: 2010-2011

Research Area(s): Emissions Trading & Offsets; Climate Mitigation Policy

Description: This research compares the draft U.S. Environmental Protection Agency Climate Leaders forest management protocol with protocols from four other offset programs: the American Carbon Registry (ACR), the Climate Action Reserve, the Chicago Climate Exchange (CCX), and the Verified Carbon Standard (VCS). We road-test these protocols for four sample projects that vary by project location and starting carbon stock levels to reveal why protocols differ in the number of offsets generated from the same sample project.

Carbon Offset Research and Education Website: www.co2offsetresearch.org

Staff: Kollmuss, A.; Lee, C.; Lazarus, M.; Chandler, C.; Greenhouse Gas Management Institute

Date: 2009-ongoing

Client/Funder: SEI

Description: SEI's Carbon Offset Research and Education (CORE) website provides an up-to-date analysis and synthesis of the most influential offset programs and activities. It reflects on lessons learned, and aims to inform consumers as well as participants and designers of current and future offset programs.

Economics of International GHG Offset and Credit Mechanisms (cross-posted)

Staff: Erickson, P.; Lazarus, M.

Date: 2009-2011

Client/Funder: Energy Foundation

Research Area(s): Emissions Trading & Offsets; Climate Mitigation Policy

Description: SEI conducted an assessment of the role of international greenhouse gas offsets in post-2012 climate policy. This project included a review of methods to assess the supply and demand of international offsets and a new quantitative assessment of the potential for double counting under the Cancun Agreements. We find that the use of international offsets, if counted both by the supplying (developing) and buying (developed) country, could effectively reduce the ambition of current pledges by up to 1.6 billion tons CO₂e in 2020, suggesting that the current pledges could well fall even further short of the abatement needed to stay on a path consistent with limiting warming to 2°C or 1.5°C.

Climate Equity

Contact: Sivan Kartha, skartha@sei-us.org
<http://sei-us.org/ClimateEquity>

The emerging climate crisis must be seen against the backdrop of an ongoing development crisis. The scientific imperative of climate change requires extensive emissions reductions in all countries, but it is politically unrealistic and ethically unacceptable to expect those struggling against poverty to focus their limited resources on averting climate change. Developing countries must still transition toward a low-GHG development path, but the global consuming class – the industrialized world and elites within developing countries – must provide the financial and technological resources that will enable this transition.



A centerpiece of SEI's work in this field is the Greenhouse Development Rights (GDRs) Framework, developed by SEI and Ecoequity, which presents a burden-sharing framework based on a straightforward accounting of national responsibility and capacity that requires those who consume and emit more than a specified "development threshold" to carry the global cost of an emergency climate program. The GDRs framework could provide the basis of a solution to the burden-sharing problem at the heart of the climate negotiating impasse. It could enable a climate regime that ensures ambitious mitigation globally to avert a climate disaster, while safeguarding the right to development in the South.

In addition, SEI contributes to the global climate policy dialogue through research, analysis, and on-the-ground engagement with Parties and non-governmental organizations involved in the United Nations Framework Convention on Climate Change process.

Selected Projects in 2011

Developmental equity in an international climate regime: Analysis, practical paths and engagement

Staff: Kartha, S.; Kemp-Benedict, E.

Date: 2011-ongoing

Client/Funder: Sida

Description: This project is built on the notion that an equitable framework is a precondition for an effective climate regime. Without developmental justice, it will not be possible to win the earnest engagement of the developing world, which is necessary for a successful global response to the climate problem. This project will continue and extend the work of the ongoing Greenhouse Development Rights project. It aims to instill a perspective of developmental equity into the climate discourse and negotiations, by providing an appropriate framing and the necessary technical, analytical and political substantiation.

Contributions to the Intergovernmental Panel on Climate Change (cross-posted)

Staff: Kartha, S.; Schipper, L.; Klein, R.J.T.

Date: 2011-ongoing

Client/Funder: IPCC

Research Area(s): Climate Equity, Adaptation & Vulnerability

Description: This project is part of SEI’s larger contribution to the *Fifth Assessment Report (AR5)* of the IPCC. Sivan Kartha is serving as Coordinating Lead Author of Chapter 4, “Sustainable Development and Equity”, of Working Group III. He is also a coordinator of the Least Developed Country and Developing Country Contact Group, which was newly constituted at the spring 2012 Lead Authors Meeting, to help ensure that the AR5 is policy-relevant to developing country decision-makers. Lisa Schipper is Lead Author of Chapter 21, “Regional Context”, of Working Group II. She was also a Lead Author of the IPCC *Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*. The drafting of the AR5 began in spring 2011, and the report will be approved and issued at the end of 2014.

UNFCCC pledge analysis: A comparison of the mitigation pledges put forward by developed and developing countries

Staff: Kartha, S.; Erickson, P.

Date: 2011

Client/Funder: Oxfam

Description: This project entailed a meta-analysis of four studies assessing the Copenhagen mitigation pledges announced by Parties to the UNFCCC. It found that across a wide range of methodologies and assumptions, studies conclude that developing countries have offered more mitigation than developed countries. The analysis was widely cited and discussed in the lead-up to COP17 in Durban, as well as during the conference.

Greenhouse Developments Rights (GDRs)

Staff: Kartha, S.; Kemp-Benedict, E.; Athanasiou, T. (EcoEquity); Baer, P. (Georgia Institute of Technology)

Date: 2006-ongoing

Client/Funder: IPS (Sida), Mistra Foundation, Rockefeller Brothers Fund, International Center for Human Rights Policy

Description: The Greenhouse Development Rights (GDRs) Framework, developed by SEI and Ecoequity, presents a burden-sharing framework based on a straightforward accounting of national responsibility and capacity that requires those who consume and emit more to carry a larger share of the global cost of an emergency climate program. Relatively wealthy people who have produced higher levels of emissions can thereby protect the right to development of the world’s poor. The GDRs framework could potentially be used to design a solution to the burden-sharing problem at the heart of the climate negotiating impasse. It could provide the basis for ambitious mitigation globally to avert a climate disaster, while safeguarding the right to development in the global South.

Sustainable Futures

Contact: Eric Kemp-Benedict, erickb@sei-us.org
<http://sei-us.org/SustainableFutures>

Investigating the potential for a sustainable future lies at the heart of all of SEI's work. This research area, however, takes a longer view, exploring different scenarios for development and building tools to help decision-makers and planners think about the future. This work falls into three broad categories:



- **Large-Scale and Long-Term Studies:** Development that is truly sustainable must take into account the larger-scale implications of development pathways, both in space and in time. How might a landscape change, for example, if biofuels production became a centerpiece of its economy? Or how might a river basin change over the coming decades if agricultural irrigation systems are widely adopted? By framing issues in this manner, SEI helps decision-makers the broader ramifications of their choices.
- **Exploring the Prospects For a Sustainability Transition:** The sustainability challenge is to achieve broadly shared prosperity indefinitely into the future while maintaining and enhancing the ecological functions that support people and other life. Meeting the challenge will require a transition from our current technological infrastructure and habits. In keeping with SEI's mission to bridge science and policy, SEI investigates technologically, environmentally, and socially feasible options to achieve this.
- **Tools and Techniques For Thinking About the Future:** Local environmental and political conditions, beliefs, preferences and histories are all crucial to the success of sustainability initiatives. Widely disseminated tools and techniques that can be used by many different groups and communities can play an essential role in achieving a sustainability transition. As SEI develops its own "futures toolkit", it shares it with others, so they can apply these tools in their own contexts.

Selected Projects in 2011

Inequality and Sustainability

Staff: Kemp-Benedict, E.; Kartha, S.; Stanton, E.A.; Fencel, A.; Olson, K.; Davis, M.; Dawkins, E.; Matin, N.

Date: 2011-ongoing

Description: While a privileged few enjoy unprecedented levels of wealth, a large share of the global population still lacks access to basic resources. This project seeks to understand how different kinds of inequality – between individuals, groups, and countries – affect the prospects for long-term sustainability, and to apply that knowledge to practical, policy-relevant questions.

Urban Metabolic Mapping: Securing the Biophysical Foundation of Indian Cities (cross-posted)

Staff: Mehta, V.; Kemp-Benedict, E.; Briggs, J.; Wang, D.

Date: 2011-ongoing

Client/Funder: SEI IPS funds

Research Area(s): Water Resources; Sustainable Futures

Description: The objective of this project is to develop a systems perspective of energy, water and material flows in Indian cities, and to provide information and deliberative modeling to the public via a geospatial web-based service. In collaboration with Indian Institute of Management and the Indian Institute of Science, Bangalore, the researchers seek to understand and communicate the socio-economic drivers of consumption in Indian cities.

Mekong Futures Project – Northeast Thailand (cross-posted)

Staff: Kemp-Benedict, E.; Mikhail, M.; Krittasudthacheewa, C. (SEI Asia); Polpanich, O. (SEI Asia); University of Khon Kaen, CSIRO

Date: 2010-ongoing

Client/Funder: Commonwealth Scientific and Industrial Research Organization (CSIRO), Australian Agency for International Development (AusAID)

Research Area(s): Sustainable Futures; Water Resources

Description: This project is a component in a larger AusAID and CSIRO-funded project on Mekong Futures. The study will apply multiple-objective planning methods to construct an integrated framework for supporting decision-making for sustainable livelihoods in Northeast Thailand. As the most impoverished agricultural region, NE Thailand has been a top priority for national development schemes, which have improved household living standards dramatically. Despite this achievement, household incomes in the region continue to depend heavily on agricultural commodities, while continually increasing energy and food demands are driving a marked change of land use. The project team will engage with the existing decision-making process of River Basin Authorities to provide decision support in exploring long-term trends, challenges, and opportunities for the region.

3C Resource Scarcity: Biomass

Staff: Kemp-Benedict, E.; Kartha, S.; Fencel, A.; Chadwick, M. (SEI York); Varnäs, A. (SEI Stockholm)

Date: 2010-2012

Client/Funder: 3C Initiative

Description: The depletion of natural resources, coupled with the significant scale and speed of growth in the developing world, is expected to have a critical long-term impact on global markets. Future climate change is also likely to impact on resource scarcity, but its subsequent implications for business remain relatively poorly understood. This project, part of a larger project on resource scarcity, examined the consequences of low carbon technologies for biomass as a fuel and chemical feedstock. The study explored the constraints posed by biomass, a renewable, but limited resource. It assessed the state of knowledge about biomass as an input into a low-carbon economy and identified potential constraints on a transition to a low-carbon economy that relies on this limited renewable resource.

Bioenergy, sustainability and trade-offs: Can we avoid deforestation while promoting bioenergy?
(cross-posted)

Staff: Kemp-Benedict, E.; Lee, C.; Resende, F.; Hammerschlag, R.; Johnson, F. and Tella, P. (SEI Stockholm); Center for International Forestry Research; Council for Scientific and Industrial Research; Universidad Nacional Autónoma de México, Joanneum Research

Date: 2009-2011

Client/Funder: European Commission

Research Area(s): Climate Mitigation Policy; Sustainable Futures

Description: SEI staff collaborated with the CGIAR Center for International Forestry Research (CIFOR), CSIR, Joanneum Research, and UNAM to assess the potential impacts of bioenergy production on forests

and forest-derived livelihoods. The work was carried out with CIFOR's Trade & Investment group and focused on biofuel production for international markets. SEI and its collaborators assessed the potential impacts of bioenergy production on forests and forest-based livelihoods. The work focused on biofuel production for international markets. SEI developed and facilitated global and regional scenario exercises, and built on a previous SEI collaboration with CIFOR.

Adaptation & Vulnerability

Contact: Lisa Schipper, lisa.schipper@sei-us.org
<http://sei-us.org/Adaptation>

Climate change is no longer just a future concern; it is here and is challenging us now and for the foreseeable future. Even if we act promptly to reduce greenhouse gas emissions, the carbon we've already pumped into the atmosphere will continue to affect our climate system. Though climate science remains uncertain, and not all will be affected equally, we can expect that many parts of the world will see higher temperatures, sea-level rise, more frequent and intense natural hazards, and changed rainfall patterns.



There is no question that we need to adapt to climate change – but there are plenty of questions on how to adapt. Many countries and communities don't know where to begin: Should they build sea-walls as defense from sea-level rise and storm surges? Should they relocate entire communities living along riverbanks, in coastal zones, or on hills and mountains? Or do they need to go further, restructuring national institutions and policies or reshaping economic development priorities? Each of these approaches has different financial, social, environmental and political implications.

This is where SEI comes in: helping countries and communities to develop and then implement sound adaptation strategies. SEI has been working on adaptation, vulnerability and resilience issues for over a decade across its seven centers, helping to identify approaches that work in a broad range of situations. The adaptation program in SEI's U.S. Center, launched in 2011, focuses on five key areas: adaptation and migration; adaptation and sustainable development; adaptation and natural resources management; risk and culture; and adaptation and disaster risk reduction.

Selected Projects in 2011

Contributions to the Intergovernmental Panel on Climate Change (cross-posted)

Staff: Kartha, S.; Schipper, L.; Klein, R.J.T.

Date: 2011-ongoing

Client/Funder: IPCC

Research Area(s): Climate Equity, Adaptation & Vulnerability

Description: This project is part of SEI's larger contribution to the *Fifth Assessment Report (AR5)* of the IPCC. Sivan Kartha is serving as Coordinating Lead Author of Chapter 4, "Sustainable Development and Equity", of Working Group III. He is also a coordinator of the Least Developed Country and Developing Country Contact Group, which was newly constituted at the spring 2012 Lead Authors Meeting, to help

ensure that the AR5 is policy-relevant to developing country decision-makers. Lisa Schipper is Lead Author of Chapter 21, “Regional Context”, of Working Group II. She was also a Lead Author of the IPCC *Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*. The drafting of the AR5 began in spring 2011, and the report will be approved and issued at the end of 2014.

Regional Climate Change Adaptation Knowledge Platform for Asia

Staff: Schipper, L.; SEI Asia Centre

Date: 2009-ongoing

Client/Funder: Sida

Description: The Adaptation Knowledge Platform is a major collaborative effort to support research on climate change adaptation; build capacity among researchers, practitioners, decision-makers and stakeholders across the region; and help integrate climate and adaptation knowledge into policy-making and planning from the national to the local levels. The AKP involves a wide range of national and regional partners, and aims to build a regionally and nationally owned information exchange mechanism and to enhance research and institutional capacity. While most of the field research is being done by partners in the individual countries, SEI provides crucial guidance, leadership and support.

Communicating Clearly on Adaptation and Disaster Risk Reduction: Writeshops for Developing Country Scientists

Staff: Schipper, L.

Date: 2010-ongoing

Client/Funder: UN International Strategy for Disaster Reduction (UN/ISDR)

Description: There is growing concern about the small number of peer-reviewed journal articles on environment and development issues that are authored by developing-country scientists. To a great extent, this is due lack of training and experience, which creates a large capacity gap. In an effort to help close this gap, SEI and UN/ISDR have sponsored a series of “writeshops” for early-career scientists and practitioners who want to build their writing skills and bring their research findings to a global audience. The first writeshop was held in Bangkok in September 2010, and several more have been held since, around the world. The goal is to help participants get their work published in peer-reviewed journals.

Support for El Salvador’s National Climate Change Plan

Staff: Schipper, L.

Date: 2011-ongoing

Client/Funder: Climate and Development Knowledge Network (CDKN)

Description: The Salvadoran Ministry of Environment and Natural Resources (MARN) has been developing a National Climate Change Strategy, aiming to reduce the country’s vulnerability to extreme weather, natural disasters and other expected climate change impacts. SEI is collaborating with PRISMA – the Salvadoran Research Program on Development and Environment – to support the effort. The project happened to begin shortly after torrential rains killed more than 30 people and displaced tens of thousands; as a result, some of the planned work was postponed, and SEI instead helped MARN prepare a reconstruction plan to be presented at an international policymakers’ meeting at the end of 2011.

PUBLICATIONS

Peer-reviewed journal articles

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Kollmuss, A. and **M. Lazarus** (2011). “Buying allowances as an alternative to offsets for the voluntary market: a preliminary review of issues and options”. *Greenhouse Gas Measurement and Management*, 1(2): 119-131. DOI: <http://dx.doi.org/10.1080/20430779.2011.578213>.

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