

Upcoming Events

FES Seminar Lecture Series: Dr. Jianbang Gan

Climate Change Transnational Leakage Of Forest Conservation: Concept, Measurement And Implications

12:00-1:00, Wednesday, Oct 12, 2011. Burke Auditorium, Kroon Hall.

Forest conservation in one country is likely to induce more harvest in other countries due to market interaction and lack of global coordination, undermining conservation efforts. The estimated leakage ranges from 42-95%, and these figures are robust without broad global cooperation. Dr. Gan will present an analytical framework for measuring forest conservation leakage across countries and regions, as well as estimates of this leakage derived from general equilibrium modeling. Implications for global forest conservation and carbon sequestration will also be discussed.

Dr Gan is a University Visiting Fellow at the School of Forestry and Environmental Studies and Professor at the Department of Ecosystem Science and Management, Texas A&M.

Science writing workshop for a broad, non-scientist audience (Yale Department of Ecology & Evolutionary Biology)

January 30 and February 6, 2012. 10:00 am to noon.

Instructor: Carl Zimmer carl@carlzimmer.com

Meeting Place: Peabody Museum Auditorium, 170 Whitney Avenue

Workshop objectives: This workshop will introduce science graduate students to writing about science for a broad, non-scientist audience.

The first session, on Jan 30, will begin with a discussion about science writing, considering techniques required for good science writing. We will use the assigned reading below as the basis for the discussion. The books are available on reserve. You might want to consider purchasing both of them; they are excellent introductions to science writing. I will describe in some detail how I produced one of my own articles, starting with the paper on which it was based. Finally, we will discuss the course assignment. We will discuss the papers about which you will be writing, and begin to plan out your pieces. So please prepare for the discussion by reading the papers.

To register, contact Karen Broderick karen.broderick@yale.edu 432-3837



Journal Publications

Carbon consequences of land cover change and expansion of urban lands: A case study in the Seattle metropolitan region

Authors: Lucy R. Hutyra, Byungman Yoon, Jeffrey Hepinstall-Cymerman, Marina Alberti

Published: 2011. *Landscape And Urban Planning*. Vol. 103(1), p 83-93.

Abstract: Understanding the role humans play in modifying ecosystems through changing land cover is central to addressing our current and emerging environmental challenges. In particular, the consequences of urban growth and land cover change on terrestrial carbon budgets is a growing issue for our rapidly urbanizing planet. Using the lowland Seattle Statistical Metropolitan Area (MSA) region as a case study, this paper explores the consequences of the past land cover changes on vegetative carbon stocks with a combination of direct field measurements and a time series of remote sensing data. Between 1986 and 2007, the amount of urban land cover within the lowland Seattle MSA more than doubled, from 1316 km² to 2798 km², respectively. Virtually all of the urban expansion was at the expense of forests with the forested area declining from 4472 km² in 1986 to 2878 km² in 2007. The annual mean rate of urban land cover expansion was 1 +/- 0.6% year⁻¹. We estimate that the impact of these regional land cover changes on aboveground carbon stocks was an average loss of 1.2 Mg C ha⁻¹ yr⁻¹ in vegetative carbon stocks. These carbon losses from urban expansion correspond to nearly 15% of the lowland regional fossil fuel emissions making it an important, albeit typically overlooked, term in regional carbon emissions budgets. As we plan for future urban growth and strive for more ecologically sustainable cities, it is critical that we understand the past patterns and consequences of urban development to inform future land development and conservation strategies

Support for climate policy and societal action are linked to perceptions about scientific agreement

Authors: Ding, D., Maibach, E., Zhao, X., Roser-Renouf, C. & Leiserowitz, A.

Published: 2011. *Nature Climate Change*. DOI: 10.1038/NCLIMATE1295

Abstract: Although a majority of US citizens think that the president and Congress should address global warming, only a minority think it should be a high priority. Previous research has shown that four key beliefs about climate change—that it is real, human caused, serious and solvable—are important predictors of support for climate policies. Other research has shown that organized opponents of climate legislation have sought to undermine public support by instilling the belief that there is widespread disagreement among climate scientists about these points—a view shown to be widely held by the public. Here we examine if this misperception is consequential. We show that the misperception is strongly associated with reduced levels of policy support and injunctive beliefs (that is, beliefs that action should be taken to mitigate global warming). The relationship is mediated by the four previously identified key beliefs about climate change, especially people's certainty that global warming is occurring. In short, people who believe that scientists disagree on global warming tend to feel less certain that global warming is occurring, and show less support for climate policy. This suggests the potential importance of correcting the widely held public misperception about lack of scientific agreement on global warming

Improving the Linkages between Air Pollution Epidemiology and Quantitative Risk Assessment

Authors: Fann N, Michelle L. Bell, K Walker, B Hubbell

Published: 2011. *Environmental Health Perspectives* 119(12), p. 1671-1675.

Background: Air pollution epidemiology plays an integral role in both identifying the hazards of air pollution as well as supplying the risk coefficients that are used in quantitative risk assessments. Evidence from both epidemiology and risk assessments has historically supported critical environmental policy decisions. The extent to which risk assessors can properly specify a quantitative risk assessment and characterize key sources of uncertainty depends in part on the availability, and clarity, of data and assumptions in the epidemiological studies.

Objectives: We discuss the interests shared by air pollution epidemiology and risk assessment communities in ensuring that the findings of epidemiological studies are appropriately characterized and applied correctly in risk assessments. We highlight the key input parameters for risk assessments and consider how modest changes in the characterization of these data might enable more accurate risk assessments that better represent the findings of epidemiological studies.

Discussion: We argue that more complete information regarding the methodological choices and input data used in epidemiological studies would support more accurate risk assessments—to the benefit of both disciplines. In particular, we suggest including additional details regarding air quality, demographic, and health data, as well as certain types of data-rich graphics.

Conclusions: Relatively modest changes to the data reported in epidemiological studies will improve the quality of risk assessments and help prevent the misinterpretation and mischaracterization of the results of epidemiological studies. Such changes may also benefit epidemiologists undertaking meta-analyses. We suggest workshops as a way to improve the dialogue between the two communities.

Assessment of indoor air pollution in homes with infants

Authors: Anna Ruth Pickett and Michelle L. Bell

Published: 2011. *International Journal of Environmental Research and Public Health* 8(12), p. 4502-4520.

Abstract: Infants spend most of their indoor time at home; however, residential air quality is poorly understood. We investigated the air quality of infants' homes in the New England area of the U.S. Participants (N = 53) were parents of infants (0–6 months) who completed telephone surveys to identify potential pollutant sources in their residence. Carbon monoxide (CO), carbon dioxide (CO₂), particulate matter with aerodynamic diameter 0.5 μm (PM_{0.5}), and total volatile organic compounds (TVOCs) were measured in 10 homes over 4–7 days, and levels were compared with health-based guidelines. Pollutant levels varied substantially across homes and within homes with overall levels for some homes up to 20 times higher than for other homes. Average levels were 0.85 ppm, 663.2 ppm, 18.7 μg/m³, and 1626 μg/m³ for CO, CO₂, PM_{0.5}, and TVOCs, respectively. CO₂, TVOCs, and PM_{0.5} levels exceeded health-based indoor air quality guidelines. Survey results suggest that nursery renovations and related potential pollutant sources may be associated with differences in urbanicity, income, and presence of older children with respiratory ailments, which could potentially confound health studies. While there are no standards for indoor residential air quality, our findings suggest that additional research is needed to assess indoor pollution exposure for infants, which may be a vulnerable population.

Model-assisted regional forest biomass estimation using LiDAR and InSAR as auxiliary data: A case study from a boreal forest area

Authors: Erik Næsset, Terje Gobakken, Svein Solberg, Timothy G. Gregoire, Ross Nelson, Göran Ståhl, Dan Weydahl

Published: 2011. *Remote Sensing of Environment*. DOI:10.1016/j.rse.2011.08.021

Abstract: There is a need for accurate inventory methods that produce relevant and timely information on the forest resources and carbon stocks for forest management planning and for implementation of national strategies under the United Nations Collaborative Program on Reduced Emissions from Deforestation and Forest Degradation in Developing Countries (REDD). Such methods should produce information that is consistent across various geographical scales. Airborne scanning Light Detection and Ranging (LiDAR) is among the most promising remote sensing technologies for estimation of forest resource information such as timber volume and biomass, while acquisition of three dimensional data with Interferometric Synthetic Aperture Radar (InSAR) from space is seen as a relevant option for inventory in the tropics because of its ability to “see through the clouds” and its potential for frequent updates at low costs. Based on a stratified probability sample of 201 field survey plots collected in a 960 km² boreal forest area in Norway, we demonstrate how total above-ground biomass (AGB) can be estimated at three distinct geographical levels in such a way that the estimates at a smaller level always sum up to the estimate at a larger level. The three levels are (1) a district (the entire study area), (2) a village, local community or estate level, and (3) a stand or patch level. The LiDAR and InSAR data were treated as auxiliary information in the estimation. At the two largest geographical levels model-assisted estimators were employed. A model-based estimation was conducted at the smallest level. Estimates of AGB and corresponding error estimates based on (1) the field sample survey were compared with estimates obtained by using (2) LiDAR and (3) InSAR data as auxiliary information. For the entire study area, the estimates of AGB were 116.0, 101.2, and 111.3 Mg ha⁻¹, respectively. Corresponding standard error estimates were 3.7, 1.6, and 3.2 Mg ha⁻¹. At the smallest geographical level (stand) an independent validation on 35 large field plots was carried out. RMSE values of 17.1–17.3 Mg ha⁻¹ and 42.6–53.2 Mg ha⁻¹ were found for LiDAR and InSAR, respectively. A time lag of six years between acquisition of InSAR data and field inventory has introduced some errors. Significant differences between estimates and reference values were found, illustrating the risk of using pure model-based methods in the estimation when there is a lack of fit in the models. We conclude that the examined remote sensing techniques can provide biomass estimates with smaller estimated errors than a field-based sample survey. The improvement can be highly significant, especially for LiDAR.

About the Role of Universities and Their Contribution to Sustainable Development

Authors: Leal Filho, W.

Published: 2011. *Higher Education Policy*, 24, (427 – 438)

Abstract: The debate on sustainable development is not new and the search for new approaches, methods and means to further the case of sustainability in a higher education context is needed today more than ever. This paper reviews the status of sustainable development at universities and presents issues which need to be considered in ensuring sustainable development is integrated in higher education institutions in a systematic way.

Awards

Best Poster Award

Postdoc Marta Vicarelli, advised by Michelle Bell, won the Best Poster Award at the Northeast Universities Development Consortium Conference for her work on ENSO and child cognitive and physical development.

Research Spotlight

Congratulations to Robert Bailis on his recent promotion to the rank of Associate Professor with term!

Here are some highlights from his recent Seminar Series lecture, “Cooking, driving, and flying: reconsidering the role of biomass in our energy mix.”

Biofuels make up 10% of all global primary energy. Of this, only a quarter is made up of modern, relatively clean liquid transportation fuels like bio-ethanol and biodiesel, and the rest is traditional biomass fuels like wood and coal. Policy actively seeks to reduce traditional use and increase modern fuel use, but Professor Bailis’s research reveals surprising details and implications of this change.



Traditional fuels like wood and coal are not sustainable. They emit a disproportional amount of CO₂ compared to other fuels, cause deforestation, and pose health hazards such as lung disease caused by indoor air pollution. Part of the reason they are still used in many countries is culture and tradition, but empirical evidence and surveys show that, if other fuels were affordable, many populations would be willing to switch. Yet the use of coal and wood continues, mostly because of poverty. People in poor countries often have no access to other fuels, and even when they can afford gas or electricity, equipment (like an electric stove) to use those fuels is beyond their means.

The reasons people are willing to switch from traditional to modern, cleaner fuels are surprising. They have nothing to do with CO₂, climate change, deforestation, or even lung problems associated with indoor fuel combustion. Instead, people report switching to cleaner fuels to save money, to save time by not having to gather firewood, and even because it enables them to “gather in a smoke-free kitchen to eat,” says Professor Bailis. Adoption of cleaner fuels and technology, then, cannot focus entirely on affordability or on engineering of stoves. Awareness of cultural norms is equally important.

For instance, in some countries, “kitchen is female territory, where some men have not entered since they were children,” says Professor Bailis, or worse, “women can be beaten for a poorly produced meal.” These and other social conditions must be carefully considered before attempts to implement any change in highly heterogeneous populations across the world. Funding should be allocated not only to engineering for efficiency, but also to the research and development of appropriate technology that fits cultural norms. Professor Bailis recommends allocating funds to education about human health and environmental hazards of combustion, for marketing, for monitoring of desired environmental and health improvement, and for quality control, because knock-offs of new technologies are popular, but are typically less efficient. Together, these measures can effectively reduce the use of biomass, as well as related health and environmental hazards.

Are modern biofuels more sustainable? The verdict is still out. Palm-based biodiesel produced in Asia, as well as biodiesel and ethanol produced from fuel crops in the US, in Europe, and South America, have their own human and environmental impacts. One of the harmful effects is land use change from natural landscapes to fuel crop fields. Without accounting for land use change, using bio-derived jet fuel reduces CO₂ emissions by 50%-60%, but taking land use change into account wipes out these benefits. Another problem is food security: farmers can make more money selling their crop for fuel than for food, causing food prices to rise in countries where poverty and malnutrition rates are already high. Finally, the labor conditions are so poor on some palm and sugar cane plantations that they have been compared to slave labor. As governments push for scaling up bio-fuel production these problems—of local land right struggles, land use change, food security, and inhumane labor conditions—must be resolved. Otherwise, biofuels are hardly the optimistic solution we all hope for.

Written by Alisa May.