

Upcoming Events

FES Seminar Lecture Series: Jutta Brunnée. "Legitimacy and Legality in International Environmental Law: Illustrations from the Climate Change Regime"

12:00-1:00, Wednesday, Nov 9, 2011. Burke Auditorium, Kroon Hall.

Professor Brunnée is a Metcalf Chair in Environmental Law at the University of Toronto. Her teaching and research focus is international environmental law. She has recently written on international relations theory and law, compliance with international law, the use of force, the domestic application of international law, multilateral environmental agreements, and international environmental liability regimes. She is the author of *Acid Rain and Ozone Layer Depletion: International Law and Regulation* and is a past editor-in-chief of the *Yearbook of International Environmental Law* (1997-2001). Her most recent book, *Legitimacy and Legality in International Law: An Interactional Account* (Cambridge University Press 2010, co-authored with S.J. Toope) was awarded the American Society of International Law's 2011 Certificate of Merit for preeminent contribution to creative scholarship.

Sanjeev Sanyal. "The Great Urban Shift: How Urbanization and Our Evolving Cities are Transforming the World We Live In"

12:00-1:00, Monday, Nov 14, 2011. Burke Auditorium, Kroon Hall.

Sanjeev Sanyal is an Indian economist, environmentalist and urban theorist. He is Deutsche Bank's Global Strategist and was named "Young Global Leader 2010" by the World Economic Forum. He is the author of the "The Indian Renaissance: India's Rise after a Thousand Years of Decline" (published by Penguin).

Sanjeev Sanyal is a well regarded environmentalist and expert on the economics of cities. He has been a strong advocate of including "walkability" and organic evolution in the way we think of cities. He is Founder of the Sustainable Planet Institute, a member of the Steering Committee of "Urban Age" at the London School of Economics and is also a Senior Fellow of the World Wildlife Fund. He is the co-founder and Director of Green Initiatives for a Smart Tomorrow (GIST) - an NGO that is a pioneer in the field of environmental accounting. He has been closely involved with Aavishkaar MicroVenture Fund which won the UN's World Business Award for 2006. He has been an Adjunct Fellow of the Institute of Policy Studies at the National University of Singapore. In 2009, he joined the Board of Governors of AFPRO, one of India's largest organizations working on food security. He has also been a Visiting Scholar at Oxford University and has also advised the UK government, United Nations Environment Programme, and other international agencies.

FES Seminar Lecture Series: Rob Bailis. "Cooking, Driving, and Flying: Reconsidering the Role of Biomass in our Energy Mix"

12:00-1:00, Wednesday, Nov 16, 2011. Burke Auditorium, Kroon Hall.

Professor Bailis's research interests focus on sustainability, resource use, and environmental change in the developing world. He explores these issues principally, though not exclusively, in the context of energy. He became interested in the intersection of energy, society, and environment while working as a teacher in the US Peace Corps in a remote community in northwestern Kenya. He uses an interdisciplinary approach that places equal emphasis on qualitative and quantitative methods across a range of scales, from local to regional and global. Past research efforts explored the social ecology of Kenya's charcoal commodity chain and examined the health and welfare implications of household energy choices in the developing world. He continues to be involved in household energy research.

Journal Publications

Climate on cable: The nature and impact of global warming coverage on Fox News, CNN, and MSNBC.

Authors: Feldman, L., Maibach, E., Roser-Renouf, C. & Leiserowitz, A.

Published: 2011, International Journal of Press/Politics. DOI: 10.1177/1940161211425410

Abstract: This study examines climate change coverage on the three major cable news channels and assesses the relationship between viewership of these channels and beliefs about global warming. Evidence from a content analysis of climate change coverage on Fox News, CNN, and MSNBC during 2007 and 2008 demonstrates that Fox takes a more dismissive tone toward climate change than CNN and MSNBC. Fox also interviews a greater ratio of climate change doubters to believers. An analysis of 2008 survey data from a nationally representative sample of U.S. adults finds a negative association between Fox News viewership and acceptance of global warming, even after controlling for numerous potential confounding factors. Conversely, viewing CNN and MSNBC is associated with greater acceptance of global warming. Further analyses reveal that the relationship between cable news viewership (both Fox and CNN/MSNBC) and global warming acceptance is stronger among Republicans than among Democrats. That is, the views of Republicans are strongly linked with the news outlet they watch, regardless of how well that outlet aligns with their political predispositions. In contrast, Democrats don't vary much in their beliefs as a function of cable news use. This asymmetry suggests that some Republicans, who as a group tend to be predisposed toward global warming skepticism, are less skeptical when exposed to information on the reality and urgency of climate change.

A landscape-based approach for assessing spatiotemporal impacts of forest biomass-based electricity generation on the age structure of surrounding forest plantations in the Southern United States.

Authors: Dwivedi, P., Bailis, R., Carter, D., Sharma, A.

Published: 2011, Global Change Biology Bioenergy (in press)

Abstract: Forest plantations support several ecosystem services including biodiversity conservation. Establishment of a forest biomass-based industry could significantly change the age structure of forest plantations located in its vicinity and thus, could lead to a possible loss of biodiversity. Therefore, this study assesses spatiotemporal impacts of a forest biomass-based power plant on the age structure of surrounding forest plantations at landscape level. A cellular automata approach was adopted and interactions between economic objectives of forest landowners and a power plant owner punctuated by forest growth and management characteristics were considered. These spatiotemporal impacts were jointly assessed for four separate scenarios and four different power plant capacities using appropriate landscape-level indices. Slash pine (*Pinus elliotti* L.) was selected as a representative species. Results indicate that the age structure of surrounding forest plantations continuously fluctuates with respect to each year of power plant operation. However, the age structure, once disturbed, never becomes comparable to the original age structure. We also found that the mature plantations were harvested during early years of power plant operation and were never observed again for the remaining years of power plant operation. This was particularly true for high capacity power plants. Similarly, high value of selected spatial index at the end of power plant life for a high capacity power plant relative to the original low value of the same index indicates aggregation of remaining plantation ages at landscape level. Establishment of low capacity forest biomass-based power plants and adoption of an integrated regional level planning approach could help in maintaining original age structure characteristics of surrounding forest plantations to a large extent. This might help in sustaining various ecosystem services including biodiversity conservation obtained from forest plantations in a long run.

Evaluating potential of understory forest biomass for bioenergy development in the Southern United States.

Authors: Marinescu, M., Dwivedi, P., Bush, T.

Published: 2011, Forestry Studies in China. (in press)

Abstract: A stratified random sampling approach was employed to quantify total biomass across prevalent non-commercial forest understory species found in six counties of northwest Florida, USA. The moisture content (wet basis) and calorific values of these species were also measured. Total green biomass from forest understory species was estimated to be around 12 million metric tons, mostly comprised of Cliftonia monophylla (titi, buckwheat tree) and Cyrilla racemiflora (white titi, swamp titi). This understory forest biomass would be sufficient to generate about 28.8 million GJ of electricity or 1589.25 million liters of ethanol. A need was identified to determine the inventory of forest understory biomass at the state level and assess the overall sustainability of utilizing forest understory biomass for bioenergy.

Smallholder agroforestry adoption in Rwanda: A SWOT-AHP analysis.

Authors: Stainback, G.A., Masozera, M., Mukuralinda, A., **Dwivedi, P.**

Published: 2011, Small-Scale Forestry. (in press)

Abstract: The perception of Rwandan government officials, NGOs, and extension specialists about smallholder agroforestry adoption as a strategy for smallholder farmers in Rwanda was investigated using a strengths, weaknesses, opportunities, and threats analysis framework combined with the analytical hierarchy process. Results indicate that smallholder agroforestry is viewed positively as a suitable strategy for Rwandan smallholder farmers. The most important positive features were the potential for increased agricultural output from agroforestry and a favorable policy environment in Rwanda supporting sustainable agriculture. Results also indicate that there needs to be better coordination of various efforts to promote agroforestry and stronger extension services for smallholder farmers. Carbon offset markets and other environmental service markets were seen as a potential opportunity for smallholder agroforestry. However, the results also indicate that there is substantial uncertainty and skepticism concerning how such markets would benefit smallholder farmers who adopted agroforestry.

Quantifying GWI of wood pellet production in the Southern United States and its subsequent utilization for electricity production in the Netherlands and Florida.

Authors: Dwivedi, P., Bailis, R., Bush, T., Marinescu, M.

Published: 2011, Bioenergy Research. 4(3): 180-192.

Abstract: This study attempts to determine global warming impact (GWI) of imported wood pellets from the Southern United States for electricity production in The Netherlands. An attempt is also made to determine GWI of utilizing produced wood pellets within the state of Florida for electricity generation instead of exports. A life-cycle approach is adopted to determine overall GWIs of both the cases. Economic objectives of forest landowners are also incorporated to determine biomass (pulpwood and harvesting residues) availability from a hectare of slash pine plantation. The GWI of a unit of electricity produced at a power plant located at Geertruidenberg, The Netherlands and Gainesville, Florida was 296.4 and 177.5 g of carbon dioxide equivalent greenhouse gas, respectively. An overall saving of 72.6% in greenhouse gas emissions was estimated for every kilowatt-hour of electricity generated using imported wood pellets in The Netherlands when compared with coal-based electricity. This value was found to be 82.4% if produced wood pellets are utilized within Florida for electricity generation instead of exports. A need exists to evaluate the potential of other feedstocks for wood pellet production like understory forest biomass. Additionally, macroeconomic and ecological impacts of utilizing forest biomass for wood pellet production needs to be quantified.

Economics of ethanol production from slash pine (*Pinus elliottii*) plantations in the Southern United States.

Authors: Nesbit, T., Alavalapati, J.R.R., Dwivedi, P., Marinescu, M.

Published: 2011, Southern Journal of Applied Forestry. 35(2): 61-66.

Abstract: A growing interest in cellulosic biofuels, coupled with the economic challenges faced by nonindustrial private forestland (NIPF) owners of the Southern United States, presents a unique opportunity to use forest biomass as a feedstock for developing bioenergy markets. This study uses a cost-benefit analysis framework to calculate the profitability for three simulated NIPF slash pine (*Pinus elliottii*) plantations under multiple feedstock production levels. Also, the unit cost of cellulosic ethanol production considering both the two-stage dilute sulfuric acid (2SDSA) and proposed synthesis gas ethanol catalytic conversion (SGECC) processes is calculated through a discounted cash flow methodology. The results show that the bioenergy market opportunity increases land values by \$28.56-37.50/ac. The calculated unit cost of production is found to be \$2.39/gallon under the 2SDSA process and \$1.16/gallon for the SGECC process. The overall analysis indicates that ethanol production from Southern slash pine plantations offers a promising option for biofuel production, but that further advancements are necessary in the ethanol conversion phase.

Role of social capital in determining conservation attitude: A case study from Cat Tien National Park, Vietnam.

Authors: Thuy, N.N., Dwivedi, P., Rossi, F., Alavalapati, J.R.R., Thapa, B.

Published: 2011, International Journal of Sustainable Development & World Ecology. 18(2):143-153.

Abstract: The Cat Tien National Park (CTNP) is located in South Vietnam. This park is home to many rare and endemic species. However, Park resources face heavy anthropogenic pressure and some species are vulnerable to extinction. In this context, this study assesses the efficacy of social capital and other socio-economic variables in influencing conservation attitude of local people towards CTNP resources. Using suitable survey tools and regression analysis, we find social capital to be a significant determinant of the overall conservation attitude of locals. All components of social capital, except trust, are significant in explaining one or more indicators of conservation attitude. Among socio-economic variables, education, income and ethnic groups were significant in explaining the overall conservation attitude. We suggest that participatory conservation programmes should incorporate suitable actions for promoting social capital among local people as a part of their institution-building efforts. This may improve institutional stability leading to better resource conservation and improved welfare of local people.

Smallholder agroforestry adoption in Rwanda: A SWOT-AHP analysis.

Authors: Stainback, G.A., Masozera, M., Mukuralinda, A., **Dwivedi, P.**

Published: 2011, Small-Scale Forestry. (in press)

Abstract: The perception of Rwandan government officials, NGOs, and extension specialists about smallholder agroforestry adoption as a strategy for smallholder farmers in Rwanda was investigated using a strengths, weaknesses, opportunities, and threats analysis framework combined with the analytical hierarchy process. Results indicate that smallholder agroforestry is viewed positively as a suitable strategy for Rwandan smallholder farmers. The most important positive features were the potential for increased agricultural output from agroforestry and a favorable policy environment in Rwanda supporting sustainable agriculture. Results also indicate that there needs to be better coordination of various efforts to promote agroforestry and stronger extension services for smallholder farmers. Carbon offset markets and other environmental service markets were seen as a potential opportunity for smallholder agroforestry. However, the results also indicate that there is substantial uncertainty and skepticism concerning how such markets would benefit smallholder farmers who adopted agroforestry.

Developing sustainability indicators for woody biomass harvesting in the United States.

Authors: Lal, P., Alavalapati, J.R.R., Marinescu, M., Matta, J.R., **Dwivedi, P.**, Susaeta, A.

Published: 2011, Journal of Sustainable Forestry. (in press)

Abstract: Bioenergy production has increased significantly in the last decade, and recent legislative efforts such as the discussion draft for the American Clean Energy and Security Act of 2009 and the Energy Independence and Security Act (EISA) of 2007 are expected to encourage even more growth. The growing demand for bioenergy will necessitate production of large quantities of woody biomass and plant residues if it is to be met. However, concerns are being raised as to how increased pressures will affect the sustainability of woody biomass. In order to avoid potential pitfalls and ensure the sustainability of wood-based bioenergy systems, a set of sustainability indicators needs to be developed. Some of these indicators can be based on standards similar to those developed for sustainable forest management, energy balances, greenhouse gas emission reductions, and existing codes and guidelines for biomass harvesting. This article discusses a potential set of sustainability indicators encompassing ecological, economic, and social principles for harvesting woody biomass for bioenergy. The extent to which existing standards and certification systems reflect these indicators is elaborated upon. Methods for making these standards operational are also suggested.

Research Spotlight:

If you have read this article on the research home page or in Yale email—sorry for double posting. David Butman's water and Carbon research is significant and exciting, so for anyone who missed it, here is the research highlight of the week:

U.S. Rivers and Streams Saturated With Carbon

New Haven, Conn.— Rivers and streams in the United States are releasing enough carbon into the atmosphere to fuel 3.4 million car trips to the moon, according to Yale researchers in *Nature Geoscience*. Their findings could change the way scientists model the movement of carbon between land, water and the atmosphere.

"These rivers breathe a lot of carbon," said David Butman, a doctoral student and co-author of a study with Pete Raymond, professor of ecosystem ecology, both at the Yale School of Forestry & Environmental Studies. "They are a source of CO₂, just like we breathe CO₂ and like smokestacks emit CO₂, and this has never been systematically estimated from a region as large as the United States."



Photo: © David Butman

The researchers assert that a significant amount of carbon contained in land, which first is absorbed by plants and forests through the air, is leaking into streams and rivers and then released into the atmosphere before reaching coastal waterways.

"What we are able to show is that there is a source of atmospheric CO₂ from streams and rivers, and that it is significant enough for terrestrial modelers to take note of it," said Butman.

They analyzed samples taken by the United States Geological Survey from over 4,000 rivers and streams throughout the United States, and incorporated highly detailed geospatial data to model the flux of carbon dioxide from water. This release of carbon, said Butman, is the same as a car burning 40 billion gallons of gasoline.

The paper, titled "Significant Efflux of Carbon Dioxide from Streams and Rivers in the United States," also indicates that as the climate heats up there will be more rain and snow, and that an increase in precipitation will result in even more terrestrial carbon flowing into rivers and streams and being released into the atmosphere.

"This would mean that any estimate between carbon uptake in the biosphere and carbon being released through respiration in the biosphere will be even less likely to balance and must include the carbon in streams and rivers," he said.

The researchers note in the paper that currently it is impossible to determine exactly how to include this flux in regional carbon budgets, because the influence of human activity on the release of CO₂ into streams and rivers is still unknown.

The research was funded by a NASA Earth and Space Science Fellowship, a NASA Carbon & Ecosystems Program grant, an NSF-CAREER grant and the Yale School of Forestry & Environmental Studies.