Science and Technology Group
Annual Report FY2015

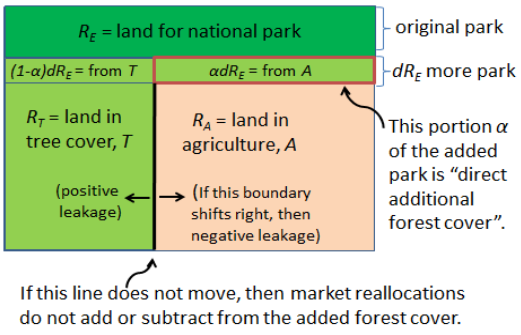
Payal Shah
Science and Technology Associate

1 Introduction

My research focuses on evaluating the social and environmental consequences of natural resource management using economic theory and formulating optimal strategies to address problems posed by environmental challenges such as climate change.

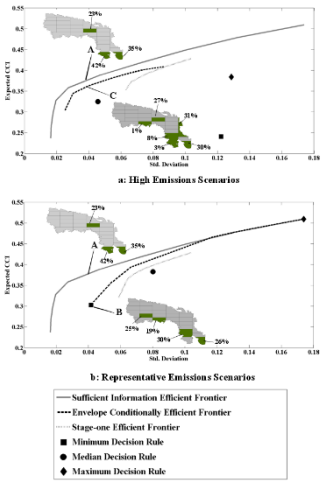
2 Activities and Findings

Economic drivers of changes in deforestation near protected areas



Setting aside land for protection can lead to an increase in forest cover ("negative leakage") or a decrease in forest cover ("positive leakage") on private land outside the protected area. We developed an analytical general equilibrium model to solve for leakage as a function of key economic variables. As seen in the figure on the left, after setting aside new land for protection, there are changes in land use patterns on remaining private land. We then use comparative statics to evaluate the effect of these economic variables on leakage. The results are empirically tested for Indonesia based on Landsat data from 2000 and 2010.

Fine-resolution conservation planning with climate change uncertainty



Climate change induced uncertainties in future spatial patterns of conservation-related outcomes make it difficult to implement standard conservation planning paradigms. We develop an iterative portfolio analysis technique that enables conservation agents to allocate scarce conservation resources across a desired level of sub-regions in a planning landscape in the absence of sufficient number of climate scenarios. We use a case study of the Prairie Pothole Region to show that lack of sufficient future climate information prevents a conservation agent from attaining the most efficient risk-return conservation outcomes. Our study highlights that the difference in expected conservation returns can be as large as 30% between conservation planning with limited climate change information and full climate change information, even when using the most efficient iterative approach.

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3 Collaborations

3.1 Choice experiment survey of Okinawa's marine environment
Researchers: Professor Yoko Fujita, University of Ryukyus
Paulo A.L.D. Nunes, Global Coordinator of ProEcoServ, United Nations
Assistant Professor Sahan Dissanayake, Colby University
3.2 Economic drivers of changes in deforestation near protected areas
Researchers: Professor Don Fullerton, University of Illinois at Urbana-Champaign
Associate Professor Kathy Baylis, University of Illinois at Urbana Champaign
3.3 Experimental study of optimal timing of irreversible land use conversion under uncertainty
Researchers: Associate Professor Kenta Tanaka, Musashi University
Assistant Professor Taro Mieno, University of Nebraska-Lincoln
3.4 Optimal conservation planning and climate change uncertainty
Researchers: Professor Amy Ando, University of Illinois at Urbana-Champaign
Associate Professor Mindy Mallory, University of Illinois at Urbana-Champaign
Glenn R. Guntenspergen, Research Ecologist, USGS
3.5 Global deforestation and protected areas
Researchers: Associate Professor Kathy Baylis, Universiy of Illinois at Urbana-Champaign
Jonah Busch, Senior Research Fellow, Center for Global Development
Jens Engelmann, Phd Candidate at the University of Wisconsin

4 Publications and other output

4. 1 Peer Reviewed Publications

Shah, Payal and Baylis, Kathy. 2015. Evaluating the Impact of Protection on Deforestation in Indonesia between 2000 and 2010 using Remote Sensing Data. *PLoS ONE* 10(6): e0124872. doi:10.1371/journal.pone.0124872
Shah, Payal and Ando, Amy W. 2015. Downside vs. symmetric risk in natural resource portfolio design to manage climate-change uncertainty. *Land Economics*, *91*(4), 664-687.

4.2 Oral Presentations

June 2015: "Evaluating Heterogeneous Conservation Effects of Forest Protection in Indonesia" (with Kathy Baylis) given at the Association of Environmental and Resource Economists Annual Meeting, San Diego, California.

4.3 Meetings and Events

OIST Mini Symposium, "Ecological and socio-economic impacts of marine and terrestrial conservation policy", March 2016, Okinawa Institute of Science and Technology Graduate University, Okinawa, Japan.