

Science and Technology Group Annual Report FY2017

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1 Introduction

My research focuses on issues of environmental conservation and sustainability of natural resources. I use economic theory and statistical methods, combined with tools from ecology and biogeography, to evaluate the impact of conservation policies and to develop optimal strategies for conservation efforts in the face of environmental and economic uncertainties. I also use contingent valuation methods to quantify the willingness of people to support and fund conservation efforts. I am a member of the OKEON (Okinawa Environmental Observatory Network) project established at OIST and currently we are working on a watershed model to identify terrestrial “hot spots” that are adversely impacting coral reefs in Okinawa.

2 Activities and Findings

1. Determinants and Implications of Global Protected Area Effectiveness

Establishing protected areas is a cornerstone of global conservation policy targeted at preservation of species and ecosystems and mitigating the impacts of climate change. We use a high resolution global data of forest cover loss from 2000 to 2012 to understand the determinants and implications of the effectiveness of global protected area network. In figure 1a, we show the preliminary results for protected area effectiveness for Asian countries. We also conduct a cost-benefit analyses of protected area

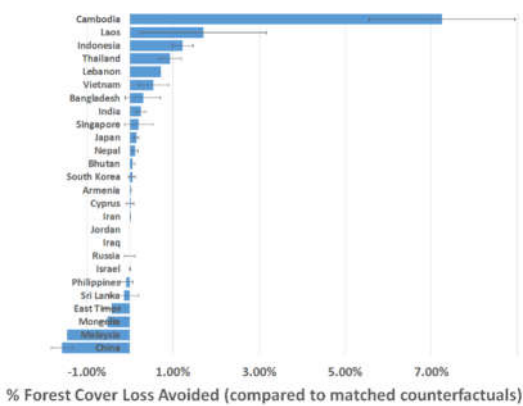


Figure 1a

effectiveness by mapping our effectiveness estimates at the country level against biodiversity indicators and the opportunity cost of establishing these protected areas. In figure 1b, we provide a snapshot of one such cost-benefit analyses for Asia.

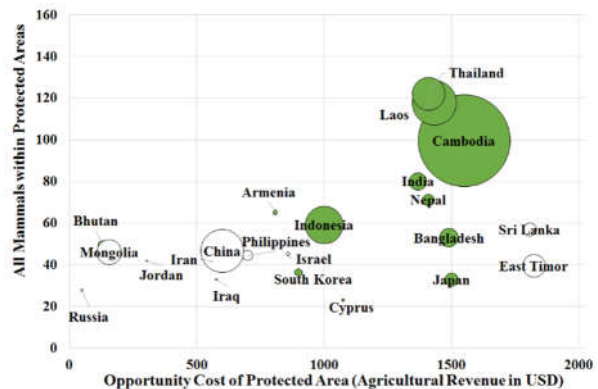


Figure 1b

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2. Portfolio analysis with spatial targeting and projects to reduce effects of climate change

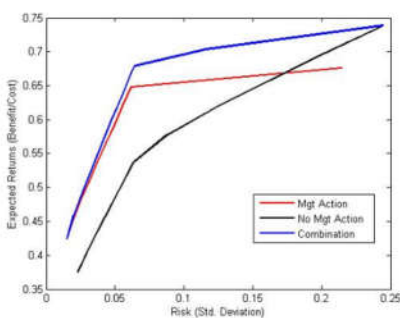


Figure 2

Climate change poses dire threats to species diversity and other ecosystem services and causes uncertain changes in future spatial patterns of conservation-related outcomes. We develop enhanced portfolio analyses tools to include options that improve outcomes under some climate scenarios at a known cost. In figure 2, we show some preliminary results. We find that conservation portfolios that do not consider investment in management action or that compulsorily include investment in management action are not the most efficient, rather, some combination of the two are more efficient.

3. Watershed modeling to identify terrestrial “hot spots” that impact coral reefs in Okinawa

Globally coral reefs and associated inshore ecosystems are increasingly threatened by runoffs from

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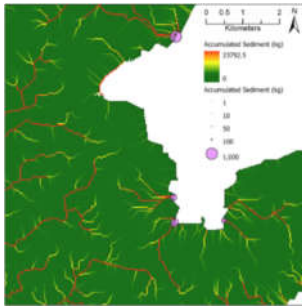


Figure 3a

land based pollutants. As part of the OKEON project at OIST, we use a watershed model to understand the potential impacts of runoff on the marine environment of Okinawa. We have collected and processed a range of datasets including time series of rainfall measurements, soil type classification, time series of land cover classification and weather data. We estimate accumulated (Figure 3a) and local

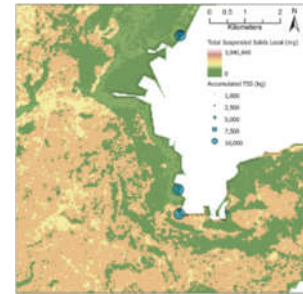


Figure 3b

(Figure 3b) runoff quantity over time. We plan on

using these run-off estimates to identify terrestrial problem areas or “hotspots” in Okinawa that may have a negative impact on marine environments.

3 Collaborations

1. Project: Choice experiment survey of Okinawa’s marine environment

Collaborators: Paulo A.L.D. Nunes, Global Coordinator of ProEcoServ, United Nations
Sahan Dissanayake, Assistant Professor, Portland State University

2. Project: Watershed modeling to identify terrestrial “hot spots” that impact coral reefs in Okinawa

Collaborators: Evan Economo, Assistant Professor, OIS Graduate University, Japan
Kenneth Dudley, Technician, OIST Graduate University, Japan
Maki Thomas, PhD Candidate, OIST Graduate University, Japan

3. Project: Optimal conservation planning and climate change uncertainty

Collaborators: Amy Ando, Professor, University of Illinois at Urbana-Champaign
Mindy Mallory, Associate Professor, University of Illinois at Urbana-Champaign
Glenn Guntenspergen, Research Ecologist, United States Geological Survey

4. Project: Global deforestation and protected areas

Collaborators: Kathy Baylis, Associate Professor, University of Illinois at Urbana-Champaign
Jonah Busch, Senior Research Fellow, Center for Global Development
Jens Engelmann, Phd Candidate, University of Wisconsin

4 Publications and other output

4.1 Peer Reviewed Publications

1. Schwanitz, Jana Valeria, Wierling, August and Shah, Payal. 2017. Assessing the impact of renewable energy on regional sustainability - A comparative study of Sogn og Fjordane (Norway) and Okinawa (Japan) focusing on the energy, food and water nexus. *Sustainability*, 9(11), 1969.
2. Mcclenachan, Loren, Matsuura, Ryunosuke, Shah, Payal and Sahan T. Dissanayake, Sahan, T. 2018. Shifted historical baselines reduce willingness to pay for conservation. *Frontiers in Marine Science*, 5, 48.

4.2 Oral Presentations

1. August 2017: Determinants and Implications of Global Protected Area Effectiveness, East Asian Association of Environmental and Resource Economists, Singapore.
2. October 2017: “Environmental Economics at OIST”. Invited presentation at Environmental Sciences Symposium, OIST Graduate University, Japan.
3. October 2017: Determinants and Implications of Global Protected Area Effectiveness, FLARE 2017 Conference, Stockholm.