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BIOECON XX:
The 20th Annual BIOECON Conference

Land-use, Agriculture and Biodiversity: Spatial and Temporal Issues

12 - 14 September 2018, Kings College, Cambridge, United Kingdom

CONFERENCE BOOK

INDEX

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BIOECON XX: The 20th ANNUAL BIOECON CONFERENCE

Land-use, Agriculture and Biodiversity: Spatial and Temporal Issues

12-14 September 2018, Kings College, Cambridge, United Kingdom

PRELIMINARY PROGRAMME

Wednesday 12 SEPTEMBER	**DAY 1: THURSDAY 13 SEPTEMBER**		**DAY 2: FRIDAY 14 SEPTEMBER**
14.00 - 19.30 REGISTRATION AND WELCOME COCKTAIL *Kings College*	7.45 - 8.45	Breakfast	Breakfast
	8.00 - 8.45	Registration	Checkout
	8.45 - 9.00	Welcome Address	Final Announcement
	9.00 - 10.00	Plenary Session 1	Plenary Session 2
	10.00 - 10.30	Coffee break	Coffee break
	10.30 - 12.30*	Parallel Sessions A1 - A4	Parallel Sessions D1 - D4
	12.30 - 13.30	Lunch	Lunch
	13.30 - 15.00	Parallel Sessions B1 - B4	Plenary Policy Session 2
	15.00 - 15.30	Coffee break	Coffee break
	15.30 - 17.00**	Parallel Sessions C1 - C4	Parallel Sessions E1 - E4
	17.00 - 18.30	Plenary Policy Session 1	
	18.30 - 19.30	BIOECON internal meetings	
	19.15 - 20.00	Pre-dinner Drinks	
	20.00 - 22.00	Social Dinner	
	*, **: Parallel MAVA funded workshop: Land Use Practices in the 21st Century.		

Wednesday 12 September 2018

8:30 - 18:00 **BIOECON – Osnabrück Pre-workshop on the Role of Social Preferences in Promoting Conservation Behaviour** *Kings College*

Due to limited seating, participation is by invitation or application only. Please send your request to elisabeth.gsottbauer@uibk.ac.at

14:00 – 19:30 Registration *Conference Office*

18:00 - 19:30 Welcome Cocktail *Back Lawn*

Thursday 13 September 2018

08:00 – 08:45 Registration *Conference Office*

08:45 – 9:00 Welcome Address – Ben Groom OPENING BIOECON XX

9:00 – 10.00 PLENARY SESSION 1

Chair: Salvatore DI FALCO *Keynes Hall*

Keynote Address

Professor Douglas Gollin, University of Oxford, UK

Title: "Conserving Genetic Resources for Agriculture: Economic Implications of Emerging Science"

10:00 – 10:30 Coffee break *Chetwynd Room*

10:30 – 12.30 BIOECON parallel workshop. Land use conservation in the 21st Century: Part 1

Funded by MAVA LAND USE FUTURES. Invited speakers and participants, BIOECON participants also welcome *Keynes Hall*

Part I: Conservation in the 21st Century

Chair: Susanna HECHT

Mark WILLIAMS, Leicester University, UK
Conservation in the Anthropocene
Discussant - Fangyuan Hua, Cambridge University, UK

Oscar VENTER – University of North British Columbia, USA
Conservation: Protected Areas and Pressures
Discussant - Paul Ferraro, John Hopkins University, USA

Tim SWANSON – Graduate Institute of International Development Studies (IHEID), Switzerland
Land, Population and Policy
Discussant – Laura Diaz Anado, Cambridge University, UK

General Discussion with Panel

10:30 – 12.30 PARALLEL SESSIONS A1 – A4

10:30 – 12:30 **PARALLEL SESSION A1: Experiments and the Environment**

Chair: Fabian THOMAS *Keynes Seminar Room 1*

Marc N. CONTE, Fordham University, UK
Information Access, Conservation Practice Choice, and Rent Seeking in Conservation Procurement Auctions: Evidence from a Laboratory Experiment
Discussant: Justin Dijk

Justin DIJK, VU University Amsterdam, Netherlands
Analysing group contract design using a lab and a lab-in-the-field threshold public good experiment
Discussant: Mirthe Boomsma

Mirthe BOOMSMA, Tilburg University
Developing a green habit: Stimulating apartment building residents to sort their household waste
Discussant: Fabian Thomas

Fabian THOMAS, University of Osnabrück, Germany,
Greening the Common Agricultural Policy – Insights from a field experiment in Lower Saxony, Germany
Discussant: Marc N. Conte

10:30 – 12:30 PARALLEL SESSION A2 – Spatial issues in Biodiversity Conservation I

Chair: George MARBUAH *Beves Room*

Ben GROOM, London School of Economics, UK
REDD+ as an area-based policy: evidence from the 2011 Moratorium on oil palm, timber and logging concessions in Indonesia
Discussant: Amanda Eigner

Amanda EIGNER, Institute for Agricultural Policy and Market Research, Justus Liebig University Giessen, Germany
Modelling impacts of structural changes on biodiversity through spatial land transformations based on an agronomy and policy
Discussant: Matt Cole

Matt COLE, Birmingham Business School, University of Birmingham, UK
Biodiversity and Economic Land Use
Discussant: George Marbuah

George MARBUAH, Swedish University of Agricultural Sciences, Sweden
Economic Activity, Species Occurrence and Spread: Evidence from Satellite Imagery Data
Discussant: Ben Groom

10:30 – 12:30 PARALLEL SESSION A3 - Natural Capital: Theory

Chair: **Mabel TIDBALL** *Saltmarsh Reception Room*

Eli FENICHEL, Yale School of Forestry & Environmental Studies, USA
Valuing Natural Capital Stocks Under Correlated Volatility
Discussant: Martin Quaas

Martin QUAAS, Kiel University, Germany
Insurance Value of Natural Capital
Discussant: Tanvir Hussain

Tanvir HUSSAIN, East West University, Bangladesh
Shadow-price valuation of natural capital under different conceptions of sustainability
Discussant: Mabel Tidball

Mabel TIDBALL, French National Institute for Agricultural Research - INRA, France
Ecosystem services, ecosystem disservices, and economic development: is it always worth to conserve natural capital?
Discussant: Eli Fenichel

10:30 – 12:30 PARALLEL SESSION A4 - Agriculture, Technology and Biodiversity

Chair: **Carlo ORECCHIA** *Saltmarsh Dining Room*

Chandan SINGHA, University of Delhi, India
Causal impact of the adoption of soil conservation measures on farm profit, revenue and variable cost in Darjeeling District, India
Discussant: Nicholas Tyack

Nicholas TYACK, Graduate Institute of International and Development Studies (IHEID), Switzerland
Local innovators in Uganda: Experimenting with improved seeds in a low adoption environment
Discussant: Esther Estruch-Bosch

Esther ESTRUCH-BOSCH, Universitat de Lleida, and Universidad Pública de Navarra, Spain
Protecting biodiversity on farm land: Which type of agri-environmental measure does it better?
Discussant: Carlo *Orecchia*

Carlo ORECCHIA, Italian Ministry of the Environment, Italy
Modelling agricultural biodiversity and land allocation in a general equilibrium framework. The case of maize and wheat in Ethiopia
Discussant: Chandan Singha

12:30 – 13:30 Lunch **Dining Hall**

13:30-15:00 BIOECON PARALLEL WORKSHOP: PART II: Population, Development and Global Public Goods

13:30-15:00: BIOECON PARALLEL WORKSHOP PART II *Keynes Hall*

Land Use Conservation in the 21st Century. Population, Development and Global Public Goods,

Funded by MAVA LAND USE FUTURES. Invited speakers and participants. BIOECON participants also welcome.

Part II: Food Security and Conservation

Chair: Tim SWANSON, IHEID, Switzerland

Hans VAN MEIJL, Wageningen University, Netherlands
Conservation in Long Run
Discussant – Hugo Vallin, IIASA, Austria

Tamas KRISZTIN, IIASA, Austria
Conservation and Food Security
Discussant -- Doug Gollin, Oxford University, UK

General Discussion with Panel

13:30-15:00 PARALLEL SESSIONS B1 - B4

13:30-15:00 PARALLEL SESSION B1 - Public Preferences for the Environment

Chair: Thiago MORELLO *Saltmarsh Reception Room*

Luca PANZONE, Newcastle University, UK
Strategies to drive consistent sustainable consumption in retailing – Evidence from an online supermarket experiment
Discussant: Charles Palmer

Charles PALMER, London School of Economics, UK
Voter choice and issue salience: environmental preferences and the 2016 Presidential election
Discussant: Thiago Morello

Thiago MORELLO, Universidade Federal do ABC, Brazil
The effect of substitutes on preferences of Great Britain population for ecological de-intensification of agriculture
Discussant: Luca Panzone

13:30 – 15.00 PARALLEL SESSION B2 – Forests I: Deforestation: Causes and Cures

Chair: Benedict PROBST *Keynes Seminar Room 1*

Derya KELES, Université de Lorraine and Université de Strasbourg, France
What drives the withdrawal of protected areas? Evidence from the Brazilian Amazon
Discussant: David Heres

David HERES, Centro de Investigación y Docencia Económicas, Mexico
Economic returns to land use and deforestation in Mexico between 2002-2011: An econometric model of land use transitions
Discussant: Benedict Probst

Benedict PROBST, University of Cambridge, UK
Can land rights prevent deforestation? Evidence from a large-scale titling initiative in the Brazilian Amazon
Discussant: Derya Keles

13:30-15:00 PARALLEL SESSION B3 – Natural Capital and Ecosystems

Chair: Moritz DRUPP *Beves Room*

Saudamini DAS, Institute of Economic Growth, India
Substitutability between built capital and natural capital: Has investment in cyclone adaptation made the storm protection by mangroves redundant?
Discussant: Katrina Davis

Katrina DAVIS, ARC Centre of Excellence for Environmental Decisions, University of Queensland, Australia
A generalizable integrated natural capital methodology to prioritise investment in saltmarsh enhancement
Discussant: Moritz Drupp

Moritz DRUPP, University of Hamburg, Germany
Inter- and Intragenerational Distribution and the Valuation of Natural Capital
Discussant: Saudamini Das

13:30-15:00 PARALLEL SESSION B4 – Instruments I: Ecosystem Auctions

Chair: Patrice LOISEL *Saltmarsh Dining Room*

Nick HANLEY, University of Glasgow, UK
Spatial Coordination and Joint Bidding in Conservation Auctions
Discussant: Pengfei Liu

Pengfei LIU, University of Arkansas, Pine Bluff, USA
Performance of Three Multi-Award Reverse Auction Mechanisms
Discussant: Patrice Loisel

Patrice LOISEL, French National Institute for Agricultural Research - INRA, France
Spatially Contiguous Land Management: a sealed bid auction format
Discussant: Nick Hanley

15:00 – 15:30 **Coffee break** *Chetwynd Room*

15:30 – 17:00 PARALLEL SESSION C1-C4

15:30 – 17.00 PARALLEL SESSION C1 – Stated Preference I: Applications

Chair: Roland OLSCHEWSKI *Keynes Seminar Room 1*

Adeniyi GBADEGESIN, Ladoke Akintola University of Technology, Nigeria
Potential impact of Climate Change on Yields of Cereals in Nigeria
Discussant: Pierre Courtois

Pierre COURTOIS, French National Institute for Agricultural Research - INRA, France
Accounting for spatially heterogeneous preferences while managing invasive species: a choice experiment
Discussant: Roland Olschewski

Roland OLSCHEWSKI, Swiss Federal Research Institute WSL, Switzerland
Bringing the neighbors in: A choice experiment on the influence of coordination and social norms on farmers' willingness to accept agro-environmental scheme across Europe
Discussant: Adeniyi Gbadesgesin

15:30 – 17.00 PARALLEL SESSION C2 – Forests II: Management

Chair: Masson SOLENE *Beves Room*

Olli TAHVONEN, University of Helsinki, Finland
Economics of mixed-species forestry with ecosystem services
Discussant: Jennifer OKONKWO

Jennifer OKONKWO, Department of Economics, Kiel University, Germany
Welfare Effects of Natural Resource Privatization: A Dynamic Analysis
Discussant: Solene Masson

Solene MASSON, Aix-Marseille University, France
Environmental conservation program and poverty: evidence from the Brazilian Amazon
Discussant: Olli Tahvonen

15:30 – 17.00 PARALLEL SESSION C3 – Natural Resources Management I

Chair: Pauli LAPPI *Saltmarsh Reception Room*

Frank WÄTZOLD, Brandenburg University of Technology Cottbus-Senftenberg, Germany
Ecological-economic modelling to assess the impact of organic farming on endangered grassland biodiversity
Discussant: Charles Figuières

Charles FIGUIERES, Aix-Marseille School of Economics, France
A tale of two diversities
Discussant: Pauli Lappi

Pauli LAPPI, Euro-Mediterranean Center on Climate Change and Ca' Foscari University of Venice, Italy
On the optimal extraction under asymmetric information over reclamation costs
Discussant: Frank Wätzold

15:30 – 17.00 PARALLEL SESSION C4 - Preferences and Behaviour

Chair: Susana MOURATO *Saltmarsh Dining Room*

Salvatore DI FALCO, University of Geneva, Switzerland
Shocks and Risk Preferences Revisted – Causal inferences from panel data versus cross-sections
Discussant: Ann-Kathrin Koessler

Ann-Kathrin KOESSLER, University of Osnabrück, Germany
Policies as information carriers: (Potential) perceptional and behavioral changes due to environmental policies
Discussant: Susana Mourato

Susana MOURATO, London School of Economics, UK
Do biodiversity conservation videos cause pro-environmental spillover effects?
Discussant: Salvatore Di Falco

17:00 – 18:30 Plenary Panel Session 1:

Panel title: "Lessons learned (if any?) from experimental evidence for the development of REDD+"

Chair / Moderator: Andreas Kontoleon, Cambridge University

Panellists:

Prof Julia Patricia GORDON JONES, School of Natural Sciences, Bangor University, UK

Dr Gabriela SIMONET, Center for Environmental Economics of Montpellier (CEE-M), French National Institute for Agricultural Research (INRA), France and Center for International Forestry Research (CIFOR), Indonesia

Prof William SUTHERLAND, Miriam Rothschild Professor of Conservation Biology, Department of Zoology, University of Cambridge, UK

Dr Sven WUNDER, Principal Scientist European Forest Institute (EFI) - Barcelona Office, Spain

18:30 – 19:30 BIOECON PARTNER MEETINGS

Scientific and Institutional Partners Meeting *Audit Room*
(BIOECON partners only)

19:15-20:00 Pre-Dinner Drinks Dining Hall

20:00-22:00 CONFERENCE SOCIAL DINNER Dining Hall

Friday 14 September 2018

08:45 – 9:00 Final Announcements : Ben GROOM *Keynes Hall*

9:00 – 10:00 PLENARY SESSION 2

Chair: Andreas KONTOLEON *Keynes Hall*

Keynote Address

Professor Paul Ferraro, John Hopkins University

Title: "Applying Behavioral Economics to Improve Environmental Programs: knowns and unknowns."

10:00 – 10:30 Coffee break *Chetwynd Room*

10:30 – 12:30 PARALLEL SESSIONS D1 - D4

10:30 – 12.30 PARALLEL SESSION D1 – Instruments II: PES and Ecosystem Services

Chair: Nick HANLEY *Beves Room*

Matthias BOESCH, Thünen Institute of International Forestry and Forest Economics, Germany
Why do payments for watershed services emerge? A cross-country analysis of adoption contexts
Discussant: Katsuya Tanaka

Katsuya TANAKA, Research Center for Sustainability and Environment, Shiga University, Japan
Predicting Farmers' Responses to Flexible Bonus-based Agri-Environmental Payments: Empirical Findings from Rice Farming in Japan
Discussant: Anca Voia

Anca VOIA, Toulouse School of Economics, France
Are Conservation Programs Additional? Evidence from the French Grassland Conservation Program
Discussant: Nick Hanley

Nick HANLEY, University of Glasgow, UK
How best to pay landowners to control invasive species? Evidence from disease control programs in Finland
Discussant: Matthias Boesch

10:30 – 12.30 PARALLEL SESSION D2 - Stated Preferences II: Applications and Methods

Chair: Jonathan QUARTEY *Saltmarsh Reception Room*

Marije SCHAAFSMA, University of Southampton, UK
Guidance for Deliberative Monetary Valuation studies
Discussant: Maria Loureiro

Maria LOUREIRO, University of Santiago de Compostela, Spain
Assessing preferences for wildfire prevention policies in Spain
Discussant: Thiago Morello

Thiago MORELLO, Universidade Federal do ABC, Brazil
Fire, tractors and health in the Amazon: incorporating heterogeneous preferences into the Hicks-Kaldor test
Discussant: Jonathan Quartey

Jonathan QUARTEY, Kwame Nkrumah University of Science and Technology, Ghana
Harnessing local community preferences for biodiversity conservation in developing countries: Evidence from Ghana's lake Bosomtwe basin
Discussant: Marije Schaafsma

10:30 – 12.30 PARALLEL SPECIAL SESSION D3 – Spatial Issues in Biodiversity Conservation II

Chair: Paula CULLEN *Keynes Hall*

Jasper MEYA, Humboldt-Universität zu Berlin, Germany
Structural benefit transfer and spatial distribution of environmental local public goods
Discussant: Maksym Polyakov

Maksym POLYAKOV, Centre for Environmental Economics and Policy, The University of Western Australia, Australia
Joining the dots versus growing the blobs: optimal spatial targeting of ecological restoration
Discussant: Zachary Turk

Zachary TURK, London School of Economics, UK
Localized pollutants and the use of clustering and dispersion as abatement strategies
Discussant: Paula Cullen

Paula CULLEN, Agriculture and Food Development Authority - TEAGASC, Ireland
Agri-environment scheme design and public goods: spatial match or mismatch
Discussant: Jasper Meya

10:30 – 12.30 PARALLEL SESSION D4 - Natural Resources Management II: Wildlife and Endangered Species

Chair: Nir Becker *Saltmarsh Dining Room*

Michael 'T SAS-ROLFES, University of Oxford, UK
Can a legal horn trade save rhinos?
Discussant: Katherine Needham

Katherine NEEDHAM, University of Glasgow
Designing Markets for Biodiversity Offsets: Lessons from Tradable Pollution Permits
Discussant: Anders Skonhoft

Anders SKONHOFT, Norwegian University of Science and Technology, Norway
Regulation of Moose Hunting in Scandinavia: The Implications of Age-Structured Models
Discussant: Nir Becker

Nir BECKER, Tel Hai Academic College, Israel
Shark tourism: Opportunities and challenges of an emerging phenomenon
Discussant: Michael 't Sas-Rolfes

12:30 – 13:30 Lunch **Dining Hall**

13:30 – 15:00 Plenary Panel Session 2: Resilience, Natural Disasters and Insurance for Ecosystems

Chair/Moderator: Julia Touza *Keynes Hall*

Participants:

Swenja Surminski, Grantham Research Institute for Climate Change and the Environment
Richard Bretton, Overseas Development Institute
And TBC

15:00 – 15:30 Coffee break *Chetwynd Room*

15:30 – 17:00 PARALLEL SESSIONS E1-E4

15:30 – 17:00 PARALLEL SESSION E1 - International Environmental Agreements

Chair: Hans-Peter WEIKARD *Beves Room*

Nils DROSTE, Lund University, Sweden
Designing a global mechanism for intergovernmental biodiversity financing
Discussant: Rüdiger Pethig

Rüdiger PETHIG, University of Siegen, Germany
Self-enforcing biodiversity agreements with financial support from North to South
Discussant: Hans-Peter Weikard

Hans-Peter WEIKARD, Wageningen University, Netherlands
Does certification improve fisheries governance? The case of MSC certification of Western Central Pacific Tuna
Discussant: Nils Droste

15:30 – 17:00 PARALLEL SESSION E2 – Climate Change and the Environment
Chair: Adrien LAGARDE *Keynes Seminar Room 1*

Anke LEROUX, Monash University, Australia
Coastal Dynamics and Adaptation to Uncertain Sea Level Rise: Optimal Portfolios for Salt Marsh Migration
Discussant: *Carlo Orecchia*

Carlo ORECCHIA, Italian Ministry of the Environment, Italy
The economic impact of soil and nutrient loss in Malawi
Discussant: *Adrien Lagarde*

Adrien LAGARDE, University of Bordeaux, France
How does MMEY mitigate bioeconomic effects of climate change for mixed fisheries
Discussant: Anke Leroux

15:30 – 17:00 PARALLEL SESSION E3 - Game Theory Conservation and Biodiversity Management
Chair: Andrew Bate *Saltmarsh Dining Room*

Martin DRECHSLER, Helmholtz Centre for Environmental Research, Germany
Modelling the effectiveness and permanence of a compensation payment scheme for the conservation of a public environmental good
Discussant: Adam Kleczkowski

Adam KLECZKOWSKI, University of Strathclyde, UK
Weakest-link control of invasive species: Impacts of memory, bounded rationality and network structure in repeated cooperative games
Discussant: Martin Drechsler

Andrew BATE, University of York, UK
Incentives for effective biosecurity-related assurance schemes
Discussant: TBA

15:30 – 17:00 PARALLEL SESSION E4 - Issues in Inequality and the Environment
Chair: Alejandro LOME-HURTADO *Saltmarsh Reception Room*

Frank VENMANS, University of Mons, Belgium
Inequality Aversion and the Environment
Discussant: Rintaro Yamaguchi

Rintaro YAMAGUCHI, National Institute of Environmental Studies, Okinawa Institute of Science and Technology Graduate University, Japan
Spatial Discounting of Ecosystem Services
Discussant: Alejandro Lome-Hurtado

Alejandro LOME-HURTADO, University of York, UK
Environmental injustice in Mexico City: A spatial-quantile approach
Discussant: Frank Venmans

17:00 CONCLUSION OF BIOECON XVIII

Keynote Speakers

DOUGLAS GOLLIN

Douglas Gollin (PHD Minnesota, 1996) is Professor of Development Economics in the Department of International Development at Oxford University. His research focuses broadly on agricultural development and economic growth, with particular interests in agricultural technologies and their impacts. Professor Gollin joined Oxford in October 2012 after spending 16 years on the faculty of Williams College in the United States. He has held visiting positions in the Economic Growth Center at Yale and at the Yale School of Forestry and Environmental Studies. Professor Gollin is a research fellow of the Centre for Economic Policy Research (CEPR) and a fellow of the Bureau for Research and Economic Analysis of Development (BREAD) managing editor of the *Journal of African Economies* and an associate editor of the *Journal of Development Economics*. From 2012-17, he chaired the Standing Panel on Impact Assessment (SPIA) of the CGIAR and served on the CGIAR Independent Science and Partnership Council. He currently sits on the Research Advisory Group of the UK Department for International Development.
https://www.qeh.ox.ac.uk/people/douglas-gollin

PAUL FERRARO

Paul J. Ferraro (PHD Cornell, 2001) is a Bloomberg Distinguished Professor at Johns Hopkins University, in the Carey Business School and the Department of Environmental Health and Engineering, a joint department of the Whiting School of Engineering and the Bloomberg School of Public Health. He is also Director of the Environmental Program Innovations Collaborative and co-Director of the USDA-funded Center for Behavioral and Experimental Agri-environmental Research. Professor Ferraro collaborates with scientists, lawyers, engineers and program administrators to develop evidence-based environmental programs. His research aims to incorporate insights from the behavioral sciences into program designs and to measure the causal effects of human behaviors and policies on the environment and human welfare. Professor Ferraro received his B.A. in biology and history and M.S. in environmental science from Duke University, and his PhD in applied economics from Cornell University in 2001. A former science advisor to the Global Environment Facility, Cambridge University Humanitas Professor of Sustainability Studies, Fulbright Scholar, Bellagio Resident Scholar, and Kathyrn Fuller Science for Nature Fund Visiting Scientist, he serves on a variety of nonprofit advisory councils.
http://carey.jhu.edu/faculty-research/faculty-directory/paul-j-ferraro-phd/

Book of Abstracts

PLENARY SESSION 1

"Conserving Genetic Resources for Agriculture: Economic Implications of Emerging Science"

Professor Douglas Gollin, University of Oxford.

From the earliest domestication of plants and animals to the present, agriculture has depended on the movement, management, and manipulation of genetic resources. However, the conservation of genetic diversity offers a potentially significant example of market failure. Farmers choose crop varieties and animal breeds in response to their own incentives. Their decisions do not account for the embedded public goods. This keynote will discuss the challenges of genetic resources conservation for agriculture in the context of emerging evidence from DNA analysis and molecular genetics. New data raises questions about where diversity is found and how best it can be collected and conserved. Technologies are changing rapidly, raising questions about strategies for managing genetic resources.

PARALLEL SESSION A1: Experiments and the Environment

Information Access, Conservation Practice Choice, and Rent Seeking in Conservation Procurement Auctions: Evidence from a Laboratory Experiment
Marc N. CONTE, Fordham University, UK
Simanti Banerjee

Existing research emphasizes the sensitivity of conservation auction performance and bidder behavior to auction design choices, as these auctions are not incentive compatible, meaning rent seeking must be controlled. Procuring agencies must decide how to provide bidders with information about the environmental quality of different conservation practices to manage the trade-off between an increased probability of selecting the optimal practice and increased rent-seeking behavior associated with this information. We utilize an induced-value laboratory experiment to explore how access to quality information and variation in the bid-submission protocol can best be combined to improve auction performance. We find that the auction performs best when a bid-menu format, in which participants submit bids for all their practices, is combined with information about the environmental quality rank of available conservation practices.

Analysing group contract design using a lab and a lab-in-the-field threshold public good experiment
Justin DIJK, VU University Amsterdam, Netherlands
J.A. Bouma, T.T.B Nguyen, E. Van der Heijden

his paper presents the results of a threshold public goods game experiment with heterogeneous players. The experiment is designed in close collaboration with the Dutch association of agrienvironmental farmer collectives. Subjects are recruited at a university ("the lab") and a farm management training centre ("lab-in-the-field"). The treatments have two different distribution rules which are varied within treatment. After subjects have experienced both, they can vote for one of the two rules: either a differentiated bonus that results in equal payoff for all, or an undifferentiated, equal share of the group bonus. Between treatments, subjects can vote for a (minimum or average) threshold or are faced with an exogenous threshold. The results indicate that exogenous thresholds perform better, possibly because the focal point they provide facilitates coordination. With regard to the two distribution rules, the results are mixed: average contributions and payoffs are higher in the lab under the 'equal-payoff'

rule, but there is no significant difference between the two in the lab-in-the-field, possibly because contributions in the lab-in-the-field are much less efficient. Overall, our results suggest that environmental payment schemes should not only consider farmer heterogeneity in the design of group contracts, but pay explicit attention to coordination problems as well.

Developing a green habit: Stimulating apartment building residents to sort their household waste
Mirthe BOOMSMA, Tilburg University
Dan van Soest, Cees Midden

In Dutch cities with many apartment buildings, waste sorting rates are low. This paper investigates whether behavioral interventions can be effective in stimulating organic waste sorting among the residents of these buildings. Using field experimental data, we show that interventions that draw on extrinsic motivations (i.e. a gift and the promise of a reward) have a positive effect on organic waste sorting, but that the average treatment effects attenuate over time. In contrast, we do find increasing and lasting effects for a treatment that is designed to enlarge intrinsic motivations by influencing household attitudes towards waste sorting. The positive treatment effect seems to be caused by households that sorted waste in the past, but that got discouraged and were no longer sorting at the start of treatment. We argue that these households were able to replenish their intrinsic motivation to such a degree that enabled them to sustain the behavioral change over multiple months.

Greening the Common Agricultural Policy – Insights from a field experiment in Lower Saxony, Germany
Fabian THOMAS, University of Osnabrück, Germany
Estelle Midler, Marianne Lefebvre, Stefanie Engel

This study investigates the behavioral economic underpinnings of the current policy approaches to integrate environmental objectives into the Common Agricultural Policy. We conduct an economic field experiment with farmers in the German state of Lower Saxony. We analyze the impact of the following policy design features on farmers' decisions to adopt environmentally-friendly agricultural practices: (i) framing of the policy: whether farmers perceive themselves as being part of the problem or the solution, (ii) degree of control: mandatory vs. voluntary policy (iii) framing of incentives as either losses or gains compared to the status-quo. All policy designs tested result in a significant increase in hectares conserved compared to a baseline scenario without policy. Also behavioral factors do significantly affect farmers' behavior at the individual level. Only framing is found to significantly affect policy effectiveness.

PARALLEL SESSION A2 - Spatial issues in Biodiversity Conservation I

REDD+ as an area-based policy: evidence from the 2011 Moratorium on oil palm, timber and logging concessions in Indonesia
Ben GROOM, London School of Economics, UK
Charles Palmer, Lorenzo Sileci

The 2011 Moratorium on new oil palm, timber and logging concessions in primary forests and peatlands is an area-based policy, which was implemented in Indonesia to scale up efforts to reduce emissions from deforestation and forest degradation (REDD+). Using quasi-experimental methods and satellite fire observations, this paper evaluates the extent to which the policy was effective in preventing the occurrence of fire, typically used to clear forests in preparation for new concessions. We find that the effect of the Moratorium is negligible when considering global changes in fire regimes from 2006-2011 to 2011-2016. Pre-existing concessions for oil palm and timber concessions perform significantly worse than areas included in the Moratorium. Conversely, logging concessions perform significantly better.

While a potential claim for the inclusion of logged and secondary forests in the Moratorium scope is valid, we argue that political factors have to be considered when designing conservation policy in Indonesia.

Modelling impacts of structural changes on biodiversity through spatial land transformations based on an agronomy and policy
Amanda EIGNER, Institute for Agricultural Policy and Market Research, Justus Liebig University Giessen, Germany
Keiko Sasaki, Ernst-August Nuppenau

Structural change influence biodiversity but is no yet spatially sophisticated implemented in economic farm models. We model spatial farming decisions and simulate field and farm size changes driven by economies of scale. Our results show landscape changes graphically and indicate a decrease in landscape heterogeneity combined with potentially severe effects on biodiversity.

Biodiversity and Economic Land Use
Matt COLE, Birmingham Business School, University of Birmingham, UK
Robert J.R. Elliott, Eric Strobl

Changing patterns of economic land use are believed to be one of the major causes of global biodiversity loss (Newbold et al. 2015). At the same time it is widely argued that phylogenetic or evolutionary distinctiveness is the preferred measure of biodiversity, allowing policymakers the ability to prioritise conservation strategies (Weitzman 1993). This paper is the first to statistically quantify the impact of economic land use on phylogenetic diversity. More specifically, we construct phylogenetic diversity indices for bird populations throughout the entire USA and match them to high resolution land use data. We find that agricultural land decreases phylogenetic diversity. In contrast, urban land use initially encourages diversity however once 27% of the local area is urbanised phylogenetic diversity falls. Using a measure of the fractionalisation of land use we also find that local phylogenetic diversity benefits from the presence of a variety of different land use types, up to a point. Using existing estimates of projected land use changes until 2051, our findings imply a potential 13% reduction in phylogenetic diversity. Back of the envelope calculations using current land prices and a number of simplifying assumptions suggest land purchases to prevent future conversion would cost in the region of US$ 980 billion.

Economic Activity, Species Occurrence and Spread: Evidence from Satellite Imagery Data
George MARBUAH, Swedish University of Agricultural Sciences, Sweden
Ing-Marie Gren, Brendan G. McKie, Laëtitia Buisson

In this paper, we address ecological and economic aspects in invasive species occurrence and spread. Specifically, we quantify the relative importance of the two factors driving the probability of occurrence of the aquatic invasive species *Elodea canadensis* Michx. across lakes in Sweden. We use satellite imagery to generate nighttime lights data as a proxy for economic activities to match ecological data on occurrences of the species at the catchment scale. A spatial probit model is used to explain the probability and dispersal of the species in lakes. With specific focus on the predictive ability of nighttime light on the invasion phenomenon, we find a robust positive relationship between economic activity and exotic aquatic invasion. This relationship is significantly characterized by spatial dependence.

PARALLEL SESSION A3 - Natural Capital: Theory

Valuing Multiple Natural Capital Stocks Under Correlated Volatility
Eli FENICHEL, Yale School of Forestry & Environmental Studies, USA
Joshua K. Abbott, Seong Do Yun

Bioeconomic models can be used to value single and multiple coupled natural capital stocks as assets under real-world management conditions. In this paper we extend prior work to consider the valuation of assets linked through deterministic relationships (i.e. biophysical coupling or shared management) to assets with stochastic dynamics including when there are multiple stock with correlated stochastic processes. We derive asset prices for natural capital stocks governed by correlated diffusions and show how function approximation techniques can be used to approximate these shadow prices across the domain of capital stocks. Using single- and multi-species examples, we demonstrate the combined role of biophysical dynamics, the management feedback rule, and the properties of the valuation function for benefits flows in influencing the salience of risk in the pricing of natural assets. Finally, we examine how the interplay between the deterministic links between capital stocks (i.e. through ecological interactions) and their covariance can enhance or dampen substitutability/complementarity relationships that are at the heart of the sustainable management dilemma.

Insurance Value of Natural Capital
Martin QUAAS, Kiel University, Germany
Stefan Baumgärtner, Michel de Lara

Nature-based solutions to insurance are in high demand. We explore the idea that natural capital has value insofar as a sufficiently high stock can buffer the effects of uncertain renewal. We outline a formal model that substantiates such claim. We propose a definition for the insurance value of natural capital for a stochastic and dynamic ecosystem that provides ecosystem services and is subject to human impacts. The insurance value of natural capital depends on the properties of ecosystem dynamics as well as on risk- and time preferences of ecosystem users. It can be positive or negative. We relate the natural insurance value to prudent use of ecosystems and precautionary investments in the natural capital stock. For the case of logarithmic utility we find that optimal management becomes more conservative with increasing uncertainty if and only if the insurance value of the natural capital stock is positive. We qualify this finding for more general forms of the intertemporal utility function.

Shadow-price valuation of natural capital under different conceptions of sustainability
Tanvir HUSSAIN, East West University, Bangladesh
M. Meyer, M.F. Quaas, S. Baumgärtner

The economic value of a natural resource measures the extent to which the resource contributes (as a means) towards attaining some given social objective (end). Thus, natural ecosystems have economic value because they sustain and enhance human wellbeing by providing various ecosystem services. A core element of this definition of value is the given social objective (end) against which a value of the natural resource can then be determined. As natural capital provides, and humans enjoy, ecosystem services over time, the social objective must specify a preference over the intertemporal distribution of ecosystem services as well. The predominant social objective in economic analyses of intertemporal resource valuation and management is the maximization of a discounted utilitarian (DU) social welfare function. Yet, the discussion of sustainable development (as seminally defined by the Brundtland Commission) has raised the awareness that we should employ intertemporal objectives that better reflect the core idea of intergenerational justice than the DU social welfare function. Over the past two decades, several intertemporal social welfare functions have been developed that capture, in one way

or another, the core idea of intergenerational justice, that is, sustainability. In this paper, we study how the economic value of natural capital, i.e. its shadow price, depends on the choice of the intertemporal social welfare function. Taking the discounted utilitarian social welfare function as a benchmark, we consider: (1) the maximin and (2) the sustainable discounted utilitarian as two alternative conceptions of intergenerational justice. We employ a generic intertemporal ecological-economic model of natural capital and ecosystem services. There are two non-overlapping generations of humans. In each generation, human actors maximize their individual utility from a manufactured consumption good and a consumptive (provisioning) ecosystem service delivered by a renewable resource stock (fishing, forestry are examples). As for the individual utility function over the manufactured good and the resource stock, we alternatively consider a Cobb-Douglas-function and a quasi-linear function. Our preliminary results show how the shadow price of the natural resource depends on the different ecological and economic model parameters, and how this differs across the different intertemporal welfare functions.

Ecosystem services, ecosystem disservices, and economic development: is it always worth to conserve natural capital?
Mabel TIDBALL, French National Institute for Agricultural Research - INRA, France
Sidnoma Traoré, Jean-Michel Salles

Although several economic growth models have incorporated natural resources and environmental quality into economic dynamics, they have not yet accounted for the ambivalent impacts of ecosystems when modelling economic development. In this paper, we consider ecosystems as a type of natural capital that enters into a production function and that generates both services and disservices. The economic dynamics of production are set by a representative agent who decides between consuming on the one hand and investing in either man-made or natural capital on the other. We study how different interactions between natural and man-made capitals, including ecosystem disservices, impact economic development. We show that different forms of interactions between the two types of capital can lead to either endogenous growth or a steady state in the long run. In so doing, this paper highlights the impact of the weight of natural capital on economic growth.

PARALLEL SESSION A4 - Agriculture, Technology and Biodiversity

Causal impact of the adoption of soil conservation measures on farm profit, revenue and variable cost in Darjeeling District, India
Chandan SINGHA, University of Delhi, India

This study attempts to evaluate the effects of on-farm soil conservation practices on farm profit and its components, revenue, and variable cost. Since farmers self-select themselves as adopters of conservation measure, there could be a problem of selection bias in evaluating their soil conservation practices. We address the selection bias by using propensity score matching. We also check if there exists spatial spill over in adoption of soil conservation measure and how it affects matching. We use primary survey data from the Darjeeling district of the Eastern Himalayan region for the year 2013. Our results suggest strong spatial correlation. The propensity score estimated from spatial model is able to provide better matches than non-spatial model. We find that the soil conservation can lead to a significant gain in revenues though they also increase costs. Thus, there is in no difference in profits.

Local innovators in Uganda: Experimenting with improved seeds in a low adoption environment
Nicholas TYACK, Graduate Institute of International and Development Studies (IHEID), Switzerland
Bozzola Martina, Tim Swanson, Helena Ting

We analyse the conditions under which the use of different agricultural technologies lead to an increase in productivity in Ugandan agriculture. We present a target-input model to conceptualize the adoption decisions of a new technology in which the optimal use of inputs is unknown. We use a nationally representative sample of Ugandan households to test the impacts of farmers' choices on a measure of farm productivity and a measure of persistence of innovation. We find little evidence that seed policy reforms implemented in Uganda in the past 20 years had any substantial impact on agricultural productivity or the commitment of most farmers to persist in using improved technologies.

Protecting biodiversity on farm land: Which type of agri-environmental measure does it better?
Esther ESTRUCH-BOSCH, Universitat de Lleida, and Universidad Pública de Navarra, Spain
Nuria Oses-Eraso, Montserrat Viladrich-Grau

Much biodiversity is found in farm land. However, there is usually a trade-off between farm land productivity and sustainability of natural resources. Biodiversity conservation in agricultural land usually requieres to carry on a serie of conservationist practices that are costly. Therefore, farmer's participation in conservationist programs requires economic incentives. Our goal is to identify which is the most appropriated policy design for garanteeing both the sustainability of the natural resources and economic efficency. We provide a model where a natural resource is affected by the cultivation practices of two types of farmers, conservationist and non-conservationist, who adjust their farming practices in response to persistent differential payoffs. We show that partnership subsidies are better than individual constant subsidies protecting natural resources.

Modelling agricultural biodiversity and land allocation in a general equilibrium framework. The case of maize and wheat in Ethiopia
Carlo ORECCHIA, Italian Ministry of the Environment, Italy
E. Gotor, L. Ortolani, G. Pallante, L. Salvatici

Although the adoption of modern varieties typically showed to have positive effect on crop productivity (Cassman, 1999), it is also true that the progressive use of modern hybrid species can reduce the number of traditional varieties and lead to a dramatic decline of inter and intra crop genetic diversity (Tilman et al., 2002; Jarvis et al., 2011). This reduction has a negative impact on agriculture's resilience to climatic shocks and there is a large evidence showing that agricultural biological diversity can significantly contribute to increase agriculture's capacity to adapt to climate change and reduce farmers' risk exposure (Di Falco and Chavas, 2009; Bellon, 2004; Jarvis et al., 2008. In addition, crop biodiversity is a key element for the functioning of ecological systems and generates benefits in terms of ecosystem services (Narloch et al., 2011). Thus, the question of whether we should foster the use of modern species or preserve the heterogeneity of crops arises. Answering such question is even more important for developing countries where agriculture represents a large part of their value added and a significant share of farmers still produce using traditional cultivation techniques preserving diversity. Previous research on economic modeling of climate change analyzing the impacts on agriculture did not explicitly consider the role of crop biodiversity as a potential adaptation factor that can mitigate the economic consequences of climate change impacts. The objective of this study is to fill this gap and provide a preliminary analysis for the Ethiopian economy on the links between crop diversity and climate change using a Computable General Equilibrium (CGE) methodology. The CGE model used is based on the Gtap 9 database (Aguiar et al. 2016) and employs a recursive dynamic version of the gtap-e model (Burniaux and Truong 2002, McDougall and Golub 2007). The Gtap database and model have been modified to take into account the different characteristics of the given crop sector distinguishing between production with modern and traditional varieties. In this revised model, it is assumed that, for each crop, the modern and traditional industries produce the same commodity (i.e. there are two industries for one commodity such as maize) which is sold in the market at the same price. This assumption is justified

by the impossibility to distinguish the two products by consumers. The study will focus on maize and wheat crops that are relevant sectors of the Ethiopian agriculture in terms of crop diversity (i.e. the share of traditional industries is significant) and are affected by climate change through both direct and indirect pathways. The CGE analysis will be used also to explore the propagation of shocks in the system and the international spillovers of economic consequences, to emphasize sectoral specificities and highlight particular vulnerabilities. The CGE analysis is supported by an econometric analysis aiming to estimate the crop productivity differential between the traditional and the modern varieties. To this end, the study utilizes the Ethiopian LSMA-ISA 2013-2014 survey of the World-Bank. The estimation approach is based on an endogenous switching regression model which allows obtaining differentiated parameters of the impact of socio-economic characteristics, national policies and agrogeological factors on both the type of varieties. In particular, the analysis also evaluates the effect of climatic shocks on the productivity of both the categories of crops thereby highlighting, ceteris paribus, their respective resilience. Such estimated impacts are used to calibrate the CGE model and simulate a climate change impact scenario on national agricultural production for Ethiopia.

PARALLEL SESSION B1 - Public Preferences for the Environment

Strategies to drive consistent sustainable consumption in retailing – Evidence from an online supermarket experiment

Luca PANZONE, Newcastle University, UK
Alistair Ulph, Denis Hilton, Ilse Gortemaker, Ibrahim Tajudeen

We used an experimental online supermarket to analyse the effect of four strategies to encourage more environmentally sustainable (low carbon footprint) consumption choices: (i) a carbon tax; (ii) feedback of past behaviour; (iii) normative goal priming; (iv) choice architecture (commodities organised into high, medium and low carbon footprint products). The store contained 665 products (mainly food) for which we had data on carbon footprint. We recruited 734 participants and gave them a weekly budget of £25; we recorded their purchasing decisions over 3 successive weeks, with the interventions occurring in weeks 2 and 3. Interventions (ii) and (iii) were ineffective in both weeks. The carbon tax reduced carbon footprint in both weeks, mainly by reducing overall spend. Choice architecture reduced carbon footprint significantly in week 3.

Voter choice and issue salience: environmental preferences and the 2016 Presidential election

Charles PALMER, London School of Economics, UK
Diana Weinhold

A large body of evidence suggests that identity-derived political affiliation is increasingly driving environmental preferences. We consider a variation on the reverse question: under what conditions might issue preferences change voters' party choice? Academic literature predicts that voters are most likely to change their party affiliation when: (1) a party's platform is distinct and transparent; and (2) the issue is important and personally salient. We argue that the explicitly anti-environmental campaign message of Donald Trump in the 2016 U.S. Presidential election fulfills the first condition; for the second condition, we exploit the plausibly exogenous spatial variation in EPA Superfund sites to generate a source of exogenous variation in the personal saliency of environmental issues. Our empirical analysis, conducted at both the individual- and countylevel, presents evidence on the relationship between Superfund and environmental preferences, establishes a robust causal link from Superfund to voter behaviour, and finally explores the possibility of heterogeneous effects via differing issue salience by age and/or income cohort. We find robust evidence that the presence of a nearby Superfund site did indeed reduce the number of votes for Trump. Specifically, our results imply that almost 490,000 voters that would have otherwise voted for Trump changed their Party vote choice based on their Superfund-

induced environmental preferences in the 2016 election. Furthermore, we find evidence of hetergeneous effects of Superfund on voting behavior associated with household income, but not with voter age cohort. In particular, we find that the effect of Superfund on support for Trump grows as household income increases from well below the poverty line to moderately low levels of around $30,000-$40,000, and then tapers off or declines. Significantly, these moderately low-income voters are precisely the income group that are also most likely to vote for Trump, suggesting that educational campaigns aimed at lower-income households to increase personal saliency of environmental issues could potentially have disproportionately large political effects.

The effect of substitutes on preferences of Great Britain population for ecological de-intensification of agriculture
Thiago MORELLO, Universidade Federal do ABC, Brazil
Tomas Badura, Ian Bateman, Amy Binner, Silvia Ferrini

Seeking to inform policy makers of Great Britain (GB) on priority places for incentivizing the shift away from high-intensity agriculture, the paper measures the effect of substitutes on preferences for low intensity agriculture and woodland, and related ecological and recreational benefits. For this, a dataset was collected with a novel methodology that incorporates the spatial nature of goods into the design of discrete choice experiments. In this approach, the options were presented to respondents both in the traditional tabular format and in an innovative personalized map format. To analyse the effects of substitutes on respondents' choices and aggregate willingness to pay, an overview of approaches is provided from the extant literature. Two metrics of substitute availability were constructed from a map classifying intensity of agriculture across whole GB. The effect of substitutes was relevant statistically and avoided biasing downward the estimation of GB population willingness to pay in 30%. In addition, the perception of relative attractiveness of sites was more consistent amongst respondents exposed to maps, attesting the effect of presentation format on preferences for spatially located environmental benefits.

PARALLEL SESSION B2 - Forests I: Deforestation: Causes and Cures

What drives the withdrawal of protected areas? Evidence from the Brazilian Amazon
Derya KELES, Université de Lorraine and Université de Strasbourg, France
Philippe Delacote , Alexander Pfaff

Since the late 1970s protected areas have been one of the most widely used regulatory tools for the conservation of ecosystem services. In this paper, we assess the possible drivers to the choice of withdrawing protected areas in the Brazilian Amazon. Protected areas are subject to inefficiencies because of the existence of conflicts over land between conservation and development activities. Further additionality is an issue, as protected areas tend to be located in areas with low opportunity cost of conservation, where forests are not likely to be cleared. This issue is particularly important in the Brazilian Amazon where growing development must be combined with the need to avoid deforestation. We first present a simple model of degazettement choice which leads us to assess how the presence of two agencies having different development and conservation objectives can lead to implementing this decision. We suggest that the probability to decide the removal of protected areas is larger in places with low and high development pressures. Then, we investigate the empirical determinants of protected area withdrawal by taking advantages of the new PADDDtracker (Protected Area Downgradement, Degazettement and Downsizement) dataset (WWF, 2017b). We confirm that the likelihood of degazettement is strongly influenced by development pressures, through characteristics of the land that enable agricultural development, and by variables related to protected area quality of enforcement and

management costs. As protected areas located in highest pressure areas are more likely to be additional, there is a risk that only the most effective protected areas may loose their protection.

Economic returns to land use and deforestation in Mexico between 2002-2011: An econometric model of land use transitions
David HERES, Centro de Investigación y Docencia Económicas, Mexico
Priscila Mortera-Gonzalez, Juan M. Torres-Rojo

As major drivers of deforestation are still present in developing countries, for forest conservation policies to be effective it is necessary to identify the determinants of the land use choice of the region being studied. In this study we estimate the transition probabilities between one land use and another one for the case of Mexico. Taking into account the economic returns to each land use, our econometric model estimates the probability that landowners switch between four land use categories: agricultural, forest, pasture, and urban. Based on the marginal effects estimated from multinomial logits, our results indicate that economic returns under each category of land use influence the probability of transit between one land use and another, except for changes in land originally in agricultural use. For this category, it does not matter in the decision making if the yields of the other categories increase or decrease. As expected, however, our preliminary results indicate that agricultural returns are the main driver of deforestation and that the required compensation for conserving forests can be substantial in areas with high productivity in competing uses. Based on the results from this model, further research will be conducted to estimate the carbon sequestration supply curve in Mexico.

Can land rights prevent deforestation? Evidence from a large-scale titling initiative in the Brazilian Amazon
Benedict PROBST, University of Cambridge, UK
Ariel BenYishay, Andreas Kontoleon, Tiago Reis

Across carbon- and biodiversity-rich tropical forests, titling initiatives are implemented with the goal of regularizing land tenure and decreasing deforestation. However, the effect of tenure security on deforestation is theoretically and empirically ambiguous. We analyse the response of 10,647 landholders between 2011-2016 to a large-scale land-titling programme called Terra Legal in the Brazilian Amazon, set to regulate an area as big as Germany and France combined. Using fixed-effects regression models and property-level data we find evidence that small and medium landholders increased deforestation in response to the programme, whereas large landholders remained largely unaffected. Landholders with property titles show a stronger deforestation response to changes in crop and agricultural prices, indicating greater market integration at the expense of conservation. Our results indicate that titling alone without greater coordination with other policies, such as the environmental registry CAR, will not yield the expected environmental benefits.

PARALLEL SESSION B3 - Natural Capital and Ecosystems

Substitutability between built capital and natural capital: Has investment in cyclone adaptation made the storm protection by mangroves redundant?
Saudamini DAS, Institute of Economic Growth, India

This study examines whether the climate change adaptation has undermined the natural resource dependence, especially for those ecosystem services for which technological substitutes have been made available. Mangroves are proven to provide storm protection and save lives during cyclones. The technological alternatives to storm protection by mangroves are early warning, dikes, and storm shelters and Governments of cyclone prone areas are investing in all these measures and are raising the

awareness of people so that evacuation to shelters increase and loss of life is minimized. This paper re-studies the storm protection by mangroves in India and found that this service from mangrove is still significant and mangroves are still protecting lives in spite of the presence of these technological alternatives in large number.

A generalizable integrated natural capital methodology to prioritise investment in saltmarsh enhancement
Katrina DAVIS, ARC Centre of Excellence for Environmental Decisions, University of Queensland, Australia
Amy Binner, Andrew Bell, Bretty Day, Siân Rees, Greg Smith, Kerrie Wilson, Ian Bateman

Saltmarshes are intertidal grasslands that produce a range of ecosystem services that underpin human wellbeing. In the UK, and globally, saltmarsh extent is decreasing—and the condition of existing areas is threatened by coastal squeeze, deteriorating water quality and agricultural activities. In this research, we identify priority areas for saltmarsh realignment: re-creation of saltmarsh in areas which have been saltmarsh in the past—but which have been 'claimed' for different land uses. We base our assessment on the ecosystem services provided by saltmarsh in the North Devon Biosphere, and the economic values of those services. We compare these economic benefits with the opportunity costs of creating new saltmarsh areas. We provide a generalizable methodology for the identification of potential managed realignment areas, using publicly available spatial data including LIDAR Composite digital terrain models. Results identify priority areas for future managed realignment, based on the economic costs and benefits of new saltmarsh areas. These results provide a necessary and timely policy tool for future management of coastal areas.

Inter- and Intragenerational Distribution and the Valuation of Natural Capital
Moritz DRUPP, University of Hamburg, Germany
Jasper N. Meya, Stefan Baumgärtner, and Martin F. Quaas

This paper studies how the intra- and intergenerational distribution of income and wealth affect the economic valuation of environmental public goods derived from natural capital. We consider both a single payment or a constant payment fraction share over time and the willingness to pay (WTP) for a marginal change of the level or the growth rate of the environmental public good. We find that the intragenerational distribution affects the intertemporal valuation of environmental goods derived from natural capital. We show that for both payment vehicles, societal mean WTP for the level as well as the growth rate of natural capital decreases (increases) with intratemporal income inequality if environmental goods derived from natural capital and consumption goods are substitutes (complements). We obtain closed-form adjustment factors for benefit transfer to control for differences in dynamic aspects between study and policy sites, such as income growth, the growth rate of the environmental goods, and interest rates. Our results are relevant for the economic appraisal of environmental policy as well as natural capital accounting and management.

PARALLEL SESSION B4 - Instruments I: Ecosystem Auctions

Spatial Coordination and Joint Bidding in Conservation Auctions
Nick HANLEY, University of Glasgow, UK
Simanti Banerjee, Timothy N. Cason, Frans P. de Vries,

Conservation auctions have been utilized in different parts of the world to implement pro-environmental land uses on private agricultural and forest landscapes. One key enhancement of such auctions would be to procure spatially adjacent land-use changes to magnify the delivery of various ecosystem services benefits. Spatial contiguity is also beneficial for enhanced biodiversity conservation in certain contexts. Recent reforms of agri-environmental policy in the Netherlands, Germany and the

UK have stressed the desirability of participation by farmers in groups, rather than as individuals. We use a laboratory experiment to examine the performance of an iterative multi-round and a single-round spatial conservation auction both in the presence and absence of joint bidding opportunities. In keeping with real life interactions within farming communities, the subjects in our experiment can communicate with their neighbors before submitting an individual and/or joint bid. Preliminary results indicate that joint bidding opportunities do not increase auction efficiency or the amount of environmental benefits realized for the spatial configurations considered in the experiment. Overall efficiency is high, however, in all treatment conditions. Rent-seeking in the auction declines in the joint bidding condition in the multi-round auction compared to the single-round auction, but is highest under this single round treatment than with individual bids.

Performance of Three Multi-Award Reverse Auction Mechanisms
Pengfei LIU, University of Arkansas, Pine Bluff, USA

This paper compares the performance of three multi-award reverse auction mechanisms using lab experiment. The first mechanism is called the Uniform Price Reverse (UPR) auction, where each winning bidder is paid the lowest rejected bid. The second mechanism is called the First Price Reverse (FPR) auction, where winning bidders are paid their submitted bids. The third mechanism is called the Generalized Second Price Reverse (GSPR) auction, where each winning bidder is paid the bid that is immediately higher. Theoretically, I derive the equilibrium bidding strategy for each auction mechanism and show that a symmetric equilibrium strategy may not exist under the GSPR auction. Empirically, lab experiment results show that UPR and GSPR auctions lead to a higher efficiency level compared to FPR, while UPR auction yields the lowest auctioneer surplus. From a valuation perspective, UPR and GSPR auctions are preferred to FPR auction.

Spatially Contiguous Land Management: a sealed bid auction format
Patrice LOISEL, French National Institute for Agricultural Research - INRA, France

Ecosystem services are deteriorating. It is essential to develop economic instruments that promote the production of ecosystem services. Conservation agencies use, among other things, payment systems for ecosystem services that remunerate private landowners to adopt pro-environmental practices on their spatially contiguous lands. Iterative or sealed bidding procedures are well suited to provide efficient incentive systems. Experiments have shown the superiority of iterative auctions. In order to better understand the processes implemented, we propose here to analyze the strategies of the landowners in the case of sealed bids auction format.

PARALLEL SESSION C1 – Stated Preference I: Applications

Potential impact of Climate Change on Yields of Cereals in Nigeria
Adeniyi GBADEGESIN, Ladoke Akintola University of Technology, Nigeria
Joshua Olusegun Ajetomobi

This study examined the potential effects of climate change on the yields of cereals in Nigeria. The research involved the use of a pooled panel data of various states producing each crop over the period of 1991-2016. The study utilized Cobb-Douglas production risk model developed by Just and Pope for yield estimation in the analysis. A panel unit root test and Maximum Likelihood Estimation technique were used to obtain reliable estimates of the model's parameters. The results showed that the mean and standard deviation of the yields of all the crops were diversely influenced by climate change.

Accounting for spatially heterogeneous preferences while managing invasive species: a choice experiment
Pierre COURTOIS, French National Institute for Agricultural Research - INRA, France
Douadia Bougherara, Maia David, Joakim Weill

Invasive species are causing tremendous impacts to ecosystems, economic activities and human welfare. Efficient management of a biological invasion requires to model these impacts, and to measure individuals' preferences for possible management plans. In this paper, we provide the first estimates of spatially differentiated preferences regarding the impacts of an invasive species. We use a spatially explicit discrete choice experiment to value the willingness to pay to reduce the invasion from an amphibious plant, the Primrose willow, in a French regional park. Our results show that the willingness to pay to reduce drastically the invasion is significant and strongly spatially differentiated, ranging from approximately 5 to 26 euros per household per year depending on the considered spatial zone. Ignoring this spatial aspect of preferences would dampen the benefits of management.

Bringing the neighbors in: A choice experiment on the influence of coordination and social norms on farmers' willingness to accept agro-environmental scheme across Europe
Roland OLSCHEWSKI, Swiss Federal Research Institute WSL, Switzerland

This paper aims to shed light on the challenges and opportunities of promoting farmers' participation in agro-environmental programs at reasonable monetary cost in intensively used agricultural landscapes. On the one hand, the study assesses the costs of coordinating farmers for the implementation of the programs, as a complement or alternative to increasing the amount of land set aside for said programs. On the other hand, the paper responds to recent calls about the need to identify incentives other than monetary payments to promote farmers participation. Methodologically, the study consists of a choice experiment exploring the willingness of farmers in Germany, Switzerland, and Spain to participate in a tree planting measure. According to our findings, the resistance of different conservation framings can affect farmers to participate in coordinated programs is not insurmountable and has to do with transaction costs as well as beliefs about other farmers' behavior. Similarly, having conservation the resistance of programs recommended by farmers can encourage other farmers to participate. Finally, farmers to participate depending on the emphasis made on the environmental benefits that farmers obtain from the programs. Overall, the findings illustrate the interest of further integrating farmers in the design of agro-environmental schemes and, further testing the feasibility of coordinated schemes in light of the influence of both monetary and social incentives.

PARALLEL SESSION C2 - Forests II: Management

Economics of mixed-species forestry with ecosystem services
Olli TAHVONEN, University of Helsinki, Finland
Janne Rämö, Mikko Mönkkönen

Specifying forest value besides raw material production by the Faustmann-Hartman setup is widely established, but criticized as restrictive in capturing diversity values. We show that extending the model to cover diversity attributes, i.e. including mixed species and internal heterogeneity within species is not enough to overcome the restrictions. Additionally, it is necessary to extend forest harvesting regimes to cover thinning (partial harvesting), continuous cover forestry, and the management of commercially useless trees. Restrictions in the Faustmann-Hartman setup are first shown analytically with optimized thinning, but without tree size structures. The empirical significance of these findings is shown by a model with four tree species, tree size structures, an extended set of forest management activities, a detailed description of harvesting costs, and a measure for stand diversity as a key factor behind ecosystem services. We show how optimal harvesting regime, net revenues, wood output, and stand diversity depend on model flexibility, economic parameters and on the valuation of ecosystem services.

In a setup allowing flexible management regimes, the costs of reaching a specified level of ecosystem services are negligible compared to the Faustmann-Hartman specification.

Welfare Effects of Natural Resource Privatization: A Dynamic Analysis
Jennifer OKONKWO, Department of Economics, Kiel University, Germany
Martin F. Quaas

This paper sets up a dynamic model to study the distributive effects of privatizing a common pool resource. We show that with or without discounting, privatization is not always Pareto improving, and derive conditions under which the poor are made worse off when private use rights are equally distributed. These conditions imply that that privatization is Pareto improving if the natural resource is sufficiently productive and if there is no discounting. Taking the reduction in harvesting during the transition phase towards a new steady state under private use rights into account, privatization is desirable for the poor only for very productive natural resources.

Environmental conservation program and poverty: evidence from the Brazilian Amazon
Solene MASSON, Aix-Marseille University, France

Nowadays, about 20% of the Brazilian Amazon is under environmental protection and 13% of its population live within these preserved areas. The role of protected areas is essential for biodiversity and environmental conservation but could also imply a cost for local populations. Thanks to a unique dataset built for the whole Brazilian Amazon, we examine how protected area implementation affects population in term of poverty for the 2000-2010 period. While Brazilian rural population tends to decrease during the decade, exposure to a protected area tends to increase the number of individuals living in rural area. However, evidence of rural population growth depends on the nature of the protected area. Strictly protected areas lead the poorest population to migrate. This makes likely that strict protection, by restricting land use and implying an increasing land scarcity, leads the poorest people to leave since they cannot exploit land anymore. On the contrary, richest people who already own their lands can keep using it.

PARALLEL SESSION C3 - Natural Resources Management I

Ecological-economic modelling to assess the impact of organic farming on endangered grassland biodiversity
Frank WÄTZOLD, Brandenburg University of Technology Cottbus-Senftenberg, Germany
Charlotte Gerling, Astrid Sturm

We applied an ecological-economic modelling procedure to analyse the impact of organically and conventionally managed meadows on endangered bird and butterfly species in Saxony, Germany. Applying the modelling procedure enables us to focus on two aspects that hitherto have been neglected in analysing the impact of organic farming on biodiversity. (1) Differences in the timing of land use between organic and conventional farming, and (2) differences in the uptake of agri-environment schemes (AES) by organic and conventional farmers. (1) We found that for the species considered the difference in the impact of conventional and organic farming is minor, because the timing of land use on most areas with organic farming is very similar to the timing on areas with conventional farming. (2) In comparison with conventional farmers organic farmers face different opportunity costs when implementing AES measures and are offered different payments for such measures. This influences organic farmers' decisions to take part in AES, which in turn has an important impact on biodiversity

conservation. In order to better conserve species it may be necessary to adapt the payment structure of AES taking into account the cost structure of organic farmers.

A tale of two diversities
Charles FIGUIERES, Aix-Marseille School of Economics, France

Efficient biodiversity management strategies aim to allocate conservation efforts in order to maximize diversity in ecological systems. Toward this end, defining a diversity criterion is an important but challenging task, as several different indices can be used as biodiversity measures. This paper elicits and compares two criteria for biodiversity conservation based on indices stemming from different disciplines: Weitzman's index in economics and Rao's index in ecology. These indices combine in different ways, information about measures of (1) species' probability distribution and (2) species' dissimilarity. As an important step toward in situ protection criteria, to these elements we add information about (3) the ecological interactions between species. Considering a simple three-species ecosystem, we show that criterion choice has palpable policy implications, as it can sometimes lead to diverging management recommendations. We disentangle the role played by elements (1), (2) and (3) in the ranking outcomes, which allows us to highlight some specificities of the two criteria. An important result is that, other things equal, Weitzman's in situ ranking tends to favor robust species least concerned by extinction, while Rao's in situ ranking generally gives priority to species the more concerned.

On the optimal extraction under asymmetric information over reclamation costs
Pauli LAPPI, Euro-Mediterranean Center on Climate Change and Ca' Foscari University of Venice, Italy

Exhaustible resource producers have better information about future reclamation costs than the regulator. This paper analyzes the second-best optimal reclamation contract between the firm and the regulator, and the optimal pollution tax and shut-down date in a two-stage model, in which extraction is followed by reclamation. The two-stage structure and timing of the model dictate a contract that extracts all the profit from the highest-cost type firm, but leaves profits for the more efficient types. The second-best reclamation effort is lower compared to the first-best, and the deviation is higher the higher is the firms cost type. It is further shown, that asymmetric information regarding the costs also affects the optimal pollution tax and the shut-down date.

PARALLEL SESSION C4 - Preferences and Behaviour

Shocks and Risk Preferences Revisted – Causal inferences from panel data versus cross-sections
Salvatore DI FALCO, University of Geneva, Switzerland
Ferdinand M. Vieider

We present data from a field experiment in Ethiopia following 1000 rural households over six years. The data allow us to revisit the literature on shocks and preferences, which has reached highly contradictory conclusions. Between respondents, we find a positive correlation between risk-tolerance and rainfall shocks. Within respondents, however, we find shocks to cause risk-tolerance to decrease. We explain these contradictory findings showing that long-term core preferences differ across geographical regions. This finding is at odds with an implicit assumption in much of the cross-sectional literature—that preferences are uniformly distributed across treated and untreated respondents ex ante.

Policies as information carriers: (Potential) perceptional and behavioral changes due to environmental policies

Ann-Kathrin KOESSLER, University of Osnabrück, Germany
Stefanie Engel

This paper discusses how policy interventions may not only alter the legal and financial framework an individual is operating in, but can also lead to perceptional changes. We argue that such changes in how a decision-maker perceives herself, relevant others, the regulator or the targeted activity can motivate behavioral changes that were neither intended nor expected when the policy was designed. In the literature, these secondary impacts of classic policy interventions have commonly been neglected. Hence, we aim to raise awareness for these effects. In this paper, we review relevant research from behavioral economics and psychology, and designate the pathways through which perceptional changes can take place. Lastly, we discuss design options with which undesired perceptional changes can be avoided when a new policy is put into practise.

Do biodiversity conservation videos cause pro-environmental spillover effects?

Susana MOURATO, London School of Economics, UK
Ganga Shreedhar

We examine whether audio-visual media interventions that aim to increase donations towards biodiversity conservation cause pro-environmental spillovers on two subsequent behavioural intentions: The Willingness to Pay (WTP) a green fee and Willingness to Donate (WTD) time to an environmental campaign. In a controlled lab experiment, we exogenously vary the media exposure to brief biodiversity conservation videos and media content on the anthropogenic cause of biodiversity endangerment. We find media exposure has a positive spillover effect on the likelihood of stating a positive WTP, but not on WTD. Media content on the anthropogenic cause of biodiversity endangerment has both a direct causal impact on the amount donated, and an indirect positive effect on the time volunteered, especially for pro-social subjects who have donated to charities outside the lab. These results highlight that media content (on the anthropogenic cause) can cause positive short-run proenvironmental behaviours when there is behavioural similarity (i.e., voluntary contributions of money and time) for subjects who hold a stronger pro-social identity (past donors).

PLENARY SESSION 2

Paul J. Ferraro, Bloomberg Distinguished Professor, Johns Hopkins University, Baltimore, MD, USA (Bloomberg School of Public Health, Carey Business School, and Whiting School of Engineering)

Applying Behavioural Economics to Improve Environmental Programs: knowns and unknowns

Applications of behavioural economics are an increasingly popular means to influence behaviours in the context of public programs. For example, governmental and nongovernmental agencies have established in-house behavioural units to apply insights from behavioural economics to improve the performance and cost-effectiveness of their programs. Claims that these behavioural science-inspired interventions can change short-term behaviours in a cost-effective manner are supported by substantial empirical evidence, often from randomized controlled trials in scholar-practitioner collaborations. Nevertheless, as in the economics literature more broadly, there is evidence that the reported behavioural impacts are exaggerated. Moreover, studies have ignored aspects of behavioural change that are important to environmental applications: (i) the persistence of the induced behavioural changes over longer-term horizons; (ii) the behavioural impacts on profit-maximizing agents or, more generally, experienced agents acting in competitive environments; (iii) the mechanisms through which the behavioural interventions affect behaviour; and (iv) interactions among behavioural interventions and between behavioural interventions and more traditional economic instruments. Professor Ferraro describes new research that addresses these issues and discusses his related experiences as Director of the Environmental Program Innovations Collaborative (EPIC) and co-Director of the Center for Behavioral and Experimental Agri-environmental Research (CBEAR).

PARALLEL SESSION D1 - Instruments II: PES and Ecosystem Services

Why do payments for watershed services emerge? A cross-country analysis of adoption contexts
Matthias BOESCH, Thünen Institute of International Forestry and Forest Economics, Germany
Peter Elsassera, Sven Wunder

Payments for watershed services (PWS) are an increasingly popular tool for watershed management in the tropics. However, the degree of PWS adoption varies across countries: while frequently represented in Latin America, water-related payment schemes do not exist in large parts of Africa and Asia. The causes for these adoption differences have so far been widely neglected. Here we address this knowledge gap with a quantitative cross-national assessment of factors influencing the decision to adopt PWS schemes across tropical countries. Based on hypotheses from the literature, we construct a logistic regression model, testing the explanatory power of various economic, institutional and physical-geographic variables on tropical PWS adoption. We show that especially factors associated with a country's topography, hydrology, demographics, and institutions significantly influence the probability of PWS adoption. Our analysis of the de facto framework conditions for PWS adoption also has repercussion for where donor investments in PWS would have the highest probabilities of success.

Predicting Farmers' Responses to Flexible Bonus-based Agri-Environmental Payments: Empirical Findings from Rice Farming in Japan
Katsuya TANAKA, Research Center for Sustainability and Environment, Shiga University, Japan

Agri-environmental payments (AEP) have been implemented for over 10 years, being considered a primary agri-environmental policy in Japan. However, program enrolment is close to its peak partly due

to budget limitations and a rigid payment scheme. However, it might be possible to increase program participation by introducing flexible payment schemes. This study investigates the effects of different bonuses (extra payments) on farmers' AEP acceptance decisions in Japan. To this end, we conducted a survey on 576 medium- and largescale rice farmers in four prefectures (Akita, Fukui, Shiga, and Shimane) by introducing three hypothetical bonus payments (scale, acquisition, and adjacency) and asking farmers about possible acceptance. Farmers' responses were subsequently used to derive their minimum acceptable bonus levels. The results show farmers are responsive to scale and adjacency bonus payments, but not to the acquisition bonus. The findings also indicate significant variations for the minimum acceptable bonus, thus reflecting considerable heterogeneity among farmers in the study region. From these results, Japan's AEP could attract more farmers and achieve significant efficiency gain without substantial budget increases.

Are Conservation Programs Additional? Evidence from the French Grassland Conservation Program
Anca VOIA, Toulouse School of Economics, France
Sylvain Chabé-Ferret

In this paper, we estimate the additionality of a major Payment for Ecosystem Services (PES) program, the French Grassland Conservation Program. We exploit the change in eligibility requirements for the extensive grazing schemes that occurred between 2000 and 2003, when the criteria of a ratio of permanent grassland to agricultural usable area higher than 75% was suppressed. We use this natural experiment in a Difference-in-Differences design. We compare changes in farm outcomes between the group of communes where the number of contracts increased after the policy reform and the group of communes where the number of contracts remained the same. We find that the policy change lead to a small increase in grassland area in treated communes, increase that comes mainly at the expense of croplands.

How best to pay landowners to control invasive species? Evidence from disease control programs in Finland
Nick HANLEY, University of Glasgow, UK
Oleg Sheremet, Enni Ruokamo, Artti Juutinen, Rauli Svento

This paper considers the problem of designing PES-type contracts to encourage participation and spatial coordination amongst private forest owners in Finland. The aim of the policy is to increase efforts to mitigate risks from invasive forest pests and diseases. Such control actions yield spill-over benefits to other landowners and to wider society, meaning that the level of privately-optimal disease control is likely to be less than the socially-optimal level. The policy designer may wish to encourage spatial coordination in the uptake of such PES-type contracts, as spatial coordination delivers an increase in the effectiveness of control measures on disease risks. We conducted a choice experiment with private forest owners in Finland in October 2016. The study elicited the preferences of woodland owners with respect to the design of forest disease control contracts, and gauged their willingness to cooperate with neighbouring forest owners within the framework of such programs.

PARALLEL SESSION D2 - Stated Preferences II: Applications and Methods

Guidance for Deliberative Monetary Valuation studies
Marije SCHAAFSMA, University of Southampton, UK
Bartosz Bartkowski, Nele Lienhoop

To respond to the growing demand for more pluralistic valuation approaches, and DMV in particular, guidance is needed in the form of recommendations for valid and reliable DMV application, similar to those for conventional WTP studies using standard SP methods (Johnston et al. 2017; Arrow et al. 1993). The purpose of this paper is therefore to develop a set of minimal requirements for study design and reporting for DMV practitioners, based upon the existing DMV literature as well as related social science literature on participation, deliberative democracy, psychology, qualitative methods, and micro-economics, including "standard" SP literature. Our first recommendation is to make a clear decision on the purpose and theoretical underpinning for deliberation. The core contribution of our paper are the practical recommendations for DMV study design focusing on the deliberation process and elicitation format, the analysis of both the deliberation and WTP results, and validity. We summarise reporting requirements for reliability, before offering conclusions and suggestions for promising future research directions.

Assessing preferences for wildfire prevention policies in Spain
Maria LOUREIRO, University of Santiago de Compostela, Spain
Maria Alló

Recent data shows that fire concentration is becoming rather predominant is Southern European areas. Specifically, the last year, 2017 was one of the worst years on record for fires in Europe, with over 800,000 hectares of land burnt in Portugal, Italy and Spain alone. Taking this context into account, we conduct a survey among Spanish households in order to understand citizens' preferences towards fire prevention programs in Spain with the aim of reducing mega-fires occurrence. We pay special attention to the role of territorial differences and the heterogeneity of preferences. We assess whether there are different levels of concern depending on the area where they live and whether this factor, among others, including the different climatic conditions may also affect the level of support for a prevention program. In general terms, we find through the application of a Choice Experiment (CE) that Spanish households are willing to support forest prevention programs to reduce the frequency of occurrence of the most aggressive wildfires. Results also show that those who live in a Mediterranean climate or in areas with a higher risk of having a wildfire suffer a clear
disutility by remaining at the actual status quo (without an effective prevention policy.

Fire, tractors and health in the Amazon: incorporating heterogeneous preferences into the Hicks-Kaldor

Thiago MORELLO, Universidade Federal do ABC, Brazil

Pollution from agricultural fires is a global health issue that requires improved policy. A generalizable economic method to identify improvements is developed. It merges discrete choice experiment and contingent valuation into a novel statistical variant of Hicks-Kaldor test that is robust to preference heterogeneity. What was applied to the western Amazon where agricultural fires are partially banned and substitutes are offered in the form of subsidized tractors. The novel test revealed that one third of the potential improvements evaluated were false improvements. This avoided misguiding government into
offering too little extra subsidy to smallholders in exchange for a harsher ban.

Harnessing local community preferences for biodiversity conservation in developing countries: Evidence from Ghana's lake Bosomtwe basin
Jonathan QUARTEY, Kwame Nkrumah University of Science and Technology, Ghana
Nick Hanley, Martina Bozzola, Alexander Kasterine, Douglas C. MacMillan

This paper assesses the extent to which the preferences of local communities around Lake Bosomtwe contribute to conservation of biodiversity, particularly when it is regarded traditionally as their god. It also assesses through a Contingent Valuation Model, the local trade-off between the Total Economic Value and the primary value of the lake. The economic implications of this trade-off are analysed for the conservation of the lake, and also serve as useful lessons for biodiversity conservation in developing countries. The results indicate that the lake is on its way to eutrophication. The government of Ghana, the international community, together with other conservation minded organizations need to act through the provision of livelihood support packages for the communities around the lake. Site-specific conservation policies based on local community preferences would also be needed to save Lake Bosomtwe.

PARALLEL SPECIAL SESSION D3 - Spatial Issues in Biodiversity Conservation II

Structural benefit transfer and spatial distribution of environmental local public goods
Jasper MEYA, Humboldt-Universität zu Berlin, Germany

This paper studies how the spatial distribution of environmental amenities with local public good characteristics affects their economic valuation. We find that the effect of environmental inequality on societal willingness to pay (WTP) for environmental local public goods is determined by their substitutability as well as how their provision is correlated with income. Moreover, we show that sorting of richer households into places with higher levels of the environmental good increases (decreases) societal WTP if and only if it is a substitute (complement) to manufactured consumption goods. We obtain novel closed-form adjustment factors for benefit transfer to control for differences in the distribution of environmental local public goods. An empirical illustration for forest preservation in Poland shows that societal WTP is up to 4 percent higher for an equal acess to forest and up to 8 percent higher for an equal distribution of both income and access to forests.

Joining the dots versus growing the blobs: optimal spatial targeting of ecological restoration
Maksym POLYAKOV, Centre for Environmental Economics and Policy, The University of Western Australia, Australia
Fiona Gibson, David J. Pannell

The primary causes of biodiversity decline worldwide are the destruction, alteration, and fragmentation of habitat resulting from human economic activities such as agriculture or property development. In regions with highly cleared and fragmented landscapes, biodiversity conservation efforts typically involve the restoration of native habitat and the rebuilding of functioning ecosystems. In this study, we use simulation to compare several commonly used strategies for spatially targeting ecological restoration efforts when creating conservation networks on private lands in a fragmented agricultural landscape. The evaluated targeting strategies are Aggregation, Connectivity, and Representativeness. We compare the effectiveness of these targeting strategies to the effectiveness of ecological restoration without targeting. We allow for heterogeneity in landowners' willingness to participate in restoration projects and explicitly assume that not all parcels within target areas will be restored. We model the probability of participation in restoration projects as a function of the private benefits of ecological restoration captured by the landowner. Results show that regardless of which targeting strategy is used, targeted ecological restoration outperforms untargeted ecological restoration. Relative effectiveness of the targeting strategies depends on landscape characteristics, species characteristics, restoration effort, and assumption about private benefits of ecological restoration. At low levels of restoration effort and

in highly cleared landscapes, Aggregation and Representativeness perform better. With larger restoration effort and in less fragmented landscapes, Connectivity becomes more effective. Accounting for the landowners' behavior through a private benefits function improves the biodiversity outcome for most species and improves the relative effectiveness of connectivity-focused strategies.

Localized pollutants and the use of clustering and dispersion as abatement strategies
Zachary TURK, London School of Economics, UK
Nick Hanley, Adam Kleczkowski, David Goulson

Regulation that aggregates or disperses locally relevant polluting activities may increase aggregate social welfare under certain conditions. In exploring these options, the specific challenges of localized pollutants are contrasted against larger scale, i.e. regional or global public goods. A flexible structure is applied to the organizational decision from a regulatory perspective and specific damage functional assumptions are discussed where either clustering or dispersion is socially preferable. While practical matters of production may bound application, the framework suggests untapped efficiencies in environmental regulation abound. I also explore applications where some expectation of damages is the relevant datum rather than an assured stock or flow of pollution. The role of consumer beliefs on damages and the differing perspectives of firms, regulators, residents of damaged communities, and nonresident consumers are discussed. This discussion provides a foundation for interpreting some of the more perplexing opinions on environmental conservation observed. A key takeaway is that the property right to the agenda- whether the organization of polluting sites or quantity of emissions is decided first, impacts aggregate social welfare.

Agri-environment scheme design and public goods: spatial match or mismatch
Paula CULLEN, Agriculture and Food Development Authority - TEAGASC, Ireland
Cathal O'Donoghue, Mary Ryan, Paul Kilgarriff, Stephen Hynes

Designing agri-environment schemes (AESs), the European Union's main policy tool to improve the environmental performance of farms, that result in participation in the areas of most need is a challenge faced by policymakers. A number of high level options are available to policy makers including the use of voluntary and mandatory measures, top-down versus participatory approaches, collaborative versus coordinated participation, and whether to target the schemes or apply them horizontally. Using Ireland as a case study, this paper assesses the evolving structure of AES design in the context of changing environmental targets, by creating an institutional framework to analyse past and current AESs and other measures. This information is then used in a spatial analysis comparing the location of important environmental public goods to participation in agri-environment schemes. The analysis shows that although higher uptake in extensive farming areas may not result in additionality, due to their extensive nature, these areas may contain high concentrations of areas of environmental concern. However, the optimal design of an AES depends on whether the specific public good targeted is global or localised as the distribution of areas of environmental concern does not always follow strong spatial patterns.

PARALLEL SESSION D4 - Natural Resources Management II: Wildlife and Endangered Species

Can a legal horn trade save rhinos?
Michael 'T SAS-ROLFES, University of Oxford, UK
Timothy Fitzgerald

The world's five rhinoceros species remain threatened with extinction in the wild despite a 40 year international trade ban on rhino products. Poachers kill rhinos for their horns, which are sought for

medicinal and ornamental purposes in Asia and command remarkably high prices on black markets. Recent attempts to restrict markets for trophy hunts and rhino horn in South Africa were followed by unprecedented increases in poaching levels. This has prompted suggestions to investigate a legal trade alternative. We develop a model of rhino conservation that takes full account of contemporary conditions (markets, institutions, technology, and relevant biological parameters) and establish conditions under which an appropriately structured legal trading regime may prevent the extinction of the white rhino in South Africa. Taking advantage of existing data on rhino populations for calibration, we simulate the bioeconomic model to assess the effects of a legal trade regime. The results indicate that intensive management of rhinos, coupled with a legal outlet for verified horn, would increase rhino numbers while lowering the effective price for horn. Substantial expenditures for protecting live rhinos are required, despite which poaching persists at greatly reduced levels. These results are then brought to bear on the broader debate over rhino policy.

Designing Markets for Biodiversity Offsets: Lessons from Tradable Pollution Permits
Katherine NEEDHAM, University of Glasgow
Frans P. de Vries, Paul R. Armsworth, Nick Hanley

Biodiversity offset schemes are increasingly being implemented to balance conservation with economic development. We provide a new perspective on biodiversity offsetting drawing on experience with tradeable pollution markets, which seem to offer insights to improve the performance of biodiversity offsets in both ecological and economic terms.

Regulation of Moose Hunting in Scandinavia: The Implications of Age-Structured Models
Anders SKONHOFT, Norwegian University of Science and Technology, Norway
Frank Jensen, Jette Bredahl Jacobsen

In this paper, we discuss optimal regulation of moose hunting in Scandinavia based on an age-structured model, which include calves, yearlings and adults. We set-up models with and without including a predator and in both models a private landowner is assumed to maximize the sum of the meat value and the browsing damage costs on trees on his own property. Contrary, a social planner maximizes the sum of the meat value, the browsing damage cost on all landowner´s property and the costs of traffic accidents. In the model without predation, we find that a subsidy to increase the harvest and reduce the population size is optimal for calves and adults. The marginal subsidy shall be differentiated between the two population stages and must include: a. the difference in the marginal browsing damage cost between the landowner and the social planner; b. the marginal cost of traffic accidents; c. the difference in shadow prices on the population restrictions between the landowner and social planner. The marginal subsidy to the harvest of yearlings needs to be zero because it is beneficial for both the landowner and social planner to let these grow and become adults. In the model with predation, the marginal subsidy to increase the harvest of calves and adult must be adjusted by the survival rates.

Shark tourism: Opportunities and challenges of an emerging phenomenon
Nir BECKER, Tel Hai Academic College, Israel
Shiri Zemah Shamir, Ziv Zemah Shamir

In the last few winters, sharks have been aggregating near the Israeli Mediterranean coast, at a specific point, near Hadera power station. This unusual phenomenon has fascinated residents, visitors, kayakers, divers and swimmers. We analyse the effects of this intense human interest on the sharks, using contingent behaviour, in Hadera and in Askelon, where sharks are present but not the infrastructure for

their observation. We also report on changes in shark behaviour due to change in tourism intensity. We find a change of about ILS 4.1 million annually for both sites but a larger individual consumer surplus in Hadera, where sharks are currently observable. Touristic intensity crosses the threshold level by about 12% and making the socio-ecological equilibrium sustainable for both humans and sharks would have a social cost of ILS 0.157 million.

PARALLEL SESSION E1 - International Environmental Agreements

Designing a global mechanism for intergovernmental biodiversity financing
Nils DROSTE, Lund University, Sweden
Joshua Farley, Irene Ring, Peter H. May, Taylor H. Ricketts

The Convention on Biological Diversity (CBD) and the Nagoya Protocol display a broad international consensus for biodiversity conservation and an equitable sharing of benefits. The CBD Aichi biodiversity targets show a need for both additional action and enhanced mobilization of financial resources. A proposal of financial burden sharing among states has not yet been developed. We propose a global scale financial mechanism to support biodiversity conservation through intergovernmental transfers. We develop three design options: ecocentric, socio-ecological and anthropocentric. We analyze the corresponding incentives to reach the Aichi target of terrestrial protected area coverage by 2020. The socio-ecological policy design provides the strongest incentives for states with the largest distance to the Aichi target. Our proposal provides a novel mechanism for global biodiversity financing, which can serve as a starting point for more specific policy dialogues on intergovernmental burden and benefit sharing.

Self-enforcing biodiversity agreements with financial support from North to South
Rüdiger PETHIG, University of Siegen, Germany
Thomas Eichner

The present paper analyzes self-enforcing biodiversity agreements (or coalitions) in a multi-country general equilibrium model. Governments split up all land in unprotected and protected land, and there are internationally traded consumption goods that use either protected or unprotected land as an input in production. Global biodiversity is increasing in aggregate protected land. The willingness to-pay for biodiversity (conservation) is positive in the 'rich' North and zero in the 'poor' South. There is an international market on which governments and possibly a coalition of northern countries may demand and/or offer unprotected land for conversion into protected land. If a coalition exists, it turns out to be the only demander on that market, and its demand is increasing in coalition size. We investigate the formation of self-enforcing coalitions when governments and the coalition either take prices as given or exert market power. We find that there are no stable coalitions, when biodiversity benefits are large, but there may be stable coalitions, even large ones, if these benefits are sufficiently small. Furthermore, in an economy with stable coalition the South may be worse off than without that coalition, in particular, if the coalition exerts market power at the expense of the South.

Does certification improve fisheries governance? The case of MSC certification of Western Central Pacific Tuna

Hans-Peter WEIKARD, Wageningen University, Netherlands
Agnes Yeeting, Megan Bailey, Simon Bush, Vina Ram-Bidesi

The world's largest tuna fishery is found in the fishing zones of eight Pacific Island countries who are Parties to the Nauru Agreement (PNA), but despite regulatory measures, monitoring and enforcement has remained weak. Since 2010, PNA member countries engaged in the Marine Stewardship Council (MSC) certification program in order to facilitate transparency and improvements of the management of tuna resources in the region. This paper examines whether and how the MSC program has achieved these expectations. The study uses firsthand information from interviews and attendance of expert meetings and employs a modified (double) principal-agent framework to examine the relationships between the PNA, its member states and private firms to examine incentive gaps and the potential of MSC certification to close these incentive gaps. To do so, we focus on the role of the MSC program in addressing imperfect control over catch and effort of purse seine fishers in PNA waters. Our findings suggest that (i) transboundary resource management is characterised by incentive gaps at different levels, and (ii) the MSC program can have a role in closing some incentive gaps (although not all), and restructure the relationships between state and fishers. We conclude that market oriented institutions like certification may have a role in facilitating goals of public resource managers.

PARALLEL SESSION E2 - Climate Change and the Environment

Coastal Dynamics and Adaptation to Uncertain Sea Level Rise: Optimal Portfolios for Salt Marsh Migration

Anke LEROUX, Monash University, Australia
Orencio Duran, Robert J. Johnston, Matthew L. Kirwan, Vance L. Martin

The sustainability of dynamic natural systems often depends on their capacity to adapt to uncertain climate-related changes, where different management options may be combined to facilitate this adaptation. Salt marshes exemplify such a system. Marsh sustainability under rapid sea level rise requires the preservation of transgression zones - undeveloped uplands onto which marshes migrate. Whether these uplands eventually become marsh depends on uncertain sea level rise and natural dynamics that determine migration onto different land types. Under conditions such as these, systematically diversified management actions likely outperform ad hoc or non-diversified alternatives. This paper develops the first adaptation portfolio model designed to optimize the benefits of a migrating coastal resource. Results are illustrated using a case study of marsh conservation in Virginia, USA. Results suggest that models of this type can enhance adaptation benefits beyond those available via current approaches.

The economic impact of soil and nutrient loss in Malawi

Carlo ORECCHIA, Italian Ministry of the Environment, Italy
Solomon Asfaw, Giacomo Pallente, Alessandro Palma

The aim of this work is to feel this gap and analyse the economic impact of both soil and nutrient loss in Malawi with new country-representative data on soil loss and nutrient indicators collected through field surveys, merged with detailed climatic data and socio-economic information. It translates soil loss/nutrient loss into yield loss and estimates the economic impact of loss on agricultural production as a result of soil degradation and then, it identifies best practices to mitigate the soil loss.

How does MMEY mitigate bioeconomic effects of climate change for mixed fisheries
Adrien LAGARDE, University of Bordeaux, France
L. Doyen, A. Ahad-Cissé, N. Caill-Milly, S. Gourguet, O. Le Pape, C. Macher, G. Morandeau, O. Thébaud

This paper examines the impact of climate change on the bio-economic performance of Bay of Biscay mixed fisheries and explores the capacity of alternative management strategies to cope with these impacts. A dynamic multi-species, multi-class, multi-fleet model is developed and calibrated using available biological, economic and environmental information for French fleets. Fishing and economic data have been collected within the European Data Collection Framework. Climate represented by the sea surface temperature is assumed to affect species recruitment. Three management strategies are compared in terms of bio-economic outcomes: the StatusQuo (SQ), a Multi-species Maximum Sustainable Yield (MMSY) strategy and a Multi-species Maximum Economic Yield (MMEY) strategy. These strategies are ranked with respect to two contrasted scenarios regarding the Representative Concentration Pathways (RCP) driving climate change. Results show that the SQ strategy is not sustainable and is characterized by a major decline of the key commercial species. By contrast, the MMSY strategy improves the ecological state and economic performance of the fishery. The MMEY strategy yields even greater bio-economic improvements. Bio-economic benefits are however altered by the effects of climate change. Under the MMEY strategy, fleets with more diversified catch structures perform better facing climate change.

PARALLEL SESSION E3 - Game Theory Conservation and Biodiversity Management

Modelling the effectiveness and permanence of a compensation payment scheme for the conservation of a public environmental good
Martin DRECHSLER, Helmholtz Centre for Environmental Research, Germany

The present submission consists of two rather short papers that deal with the performance of compensation payment schemes, employing game-theoretical approaches within a grid-based dynamic ecological-economic model. The first paper introduces the environmental problem: the trade-off between the selfish maximization of agricultural profit and the conservation of pollinators that benefit the entire farming community. In their individual land-use decisions, famers decide to either spray their land with pesticides to eliminate pests – with the unintended but unavoidable adverse side effect that this also eliminates beneficial pollinators, or to accept pest-induced losses but conserve the pollinators. The pollinators are assumed to be mobile, representing a public good, and their elimination on a particular land parcel leads to negative spatial externalities to neighbouring farmers. Three behavioural strategies are considered for each farmer: Cooperate (i.e. do not spray), defect (spray) and tit-for-tat (spray if neighbours sprayed previously and do not spray otherwise). The present model is used to analyse, among others, the circumstances under which a compensation payment that is paid to cooperating farmers, can induce cooperation in the farming community. The results highlight the relevance of the tit-for-tat strategy for yielding effectiveness of the payment scheme.

The second paper relativises this result by employing an evolutionary game-theoretic approach. While in the first paper the famers are either all cooperative, all defecting, or all titfor-tat players, in the second paper each famer can in any time step choose one of these three strategies, and s/he does so in a way that maximizes his/her expected profit. The analysis of this model reveals that even at rather low payment levels, a considerable proportion of the farmers plays tit-for-tat, which confirms the well-known result that tit-for-tat is a viable strategy even if a considerable proportion of the other players defects. What has not yet been tested, however, is whether tit-for-tat also leads to the protection of the public good. The model analysis reveals that this is not the case. Instead, tit-for-tat players appear as

opportunists: their frequency of cooperation is precisely determined by the proportion of cooperators in the population, and if – due to low payment levels – the defectors are in the majority compared to the cooperators, a correspondingly large majority of the tit-for-tat players effectively defects. I conclude that the tit-for-tat strategy, even though it is commonly understood as a model for overcoming selfishness and developing altruism, fails in the protection of a public good.

Weakest-link control of invasive species: Impacts of memory, bounded rationality and network structure in repeated cooperative games

Adam KLECZKOWSKI, University of Strathclyde, UK

Andrew Bate, Michael Redenti, Nick Hanley

The nature of dispersal of many invasive pests and pathogens in agricultural and forestry makes it necessary to consider how the actions of one manager affect neighbouring properties. In addition to the direct effects of a potential spread of a pest and the resulting economic loss, there are also indirect consequences that affect whole regions and that require coordinated actions to manage and/or to eradicate it (like movement restrictions). In this paper we address the emergence and stability of cooperation among agents who respond to a threat of an invasive pest or disease. The model, based on the weakest-link paradigm, uses repeated multi-participant coordination games where players' pay-offs depend on management decisions to prevent the invasion on their own land as well as of their neighbours on a network. We show that for the basic cooperation game agents select the risk-dominant strategy of a Stag hunt game over the pay-off dominant strategy of implementing control measures. However, cooperation can be achieved by the social planner offering a biosecurity payment. The critical level of this payment depends on the details of the decision-making process, with higher trust (based on reputation of other agents reflecting their past performance) allowing significant reduction in necessary payments and slowing down decay in cooperation when the payment is low. We also find that allowing for uncertainty in decision-making process can enhance cooperation for low levels of payments. Finally, we show the importance of industry structure to the emergence of cooperation, with increase in the average coordination number of network nodes leading to increase in the critical biosecurity payment.

Incentives for effective biosecurity-related assurance schemes

Andrew BATE, University of York, UK

Glyn Jones, Adam Kleczkowski, Alan MacLeod, Julia Touza, Piran C.L. White

As a weaker link public good, private investment in biosecurity is undermined by the lack of investment of others, leading to investment far from the social optimum that requires widespread cooperation. The UK horticultural industry is exploring whether a biosecurity-related assurance scheme can be an effective mechanism to encourage cooperation and improve overall biosecurity to prevent outbreaks of diseases like *Xylella fastidiosa*, but there are concerns over whether such a scheme can get sufficient membership to be effective. We model the biosecurity-related assurance scheme as a coalition game that incorporates damages from outbreaks (both for those infected and those not infected but who suffer damages from nearby infections) as well as the cost of biosecurity investment. We find that without additional incentives, these schemes will have little impact as the incentives to freeride become strong leading to small coalitions with little improvement in overall biosecurity. However, reducing disease damages for members can incentivise joining, leading to larger coalitions and often large improvements in overall biosecurity. In particular, we find that the reduction in damages that just about gets everyone to join the coalition provides the greatest improvement in overall biosecurity. Additionally, we find that targeting this reduction of damages can lead improvements in biosecurity that are more robust. This demonstrates that without careful thought around incentives for joining, biosecurity-related assurance schemes will likely have little impact.

PARALLEL SESSION E4 - Issues in Inequality and the Environment

Inequality Aversion and the Environment
Frank VENMANS, University of Mons, Belgium
Ben Groom

Measures of inequality aversion and pure time preference are elicited in environmental domains using hypothetical decision tasks. Estimates are elicited using comparisons of inequalities across space and time, with gain/loss and past/present contextual framing. Inequality aversion is shown to depend on the environmental domain, time and space and framing. Inequality aversion is lower in the temporal than in the spatial domain, and lower still if the future is 'green' rather than 'brown' for air pollution, forests, and soil fertility. Pure time preference also differs across environmental domains and framing. The results cast doubt on the classical Utilitarian formulation of inter-temporal social welfare, but provide empirical evidence to calibrate dual discount rates or changing relative prices. This is important for welfare evaluation of long-term interventions with environmental consequences, like climate change mitigation or biodiversity conservation.

Spatial Discounting of Ecosystem Services
Rintaro YAMAGUCHI, National Institute of Environmental Studies, Okinawa Institute of Science and Technology Graduate University, Japan
Payal Shah

The impact of conservation efforts targeted at preserving ecosystem services will largely depend on the welfare implications associated with spatial variations in the consumption and provision of ecosystem services. While there is ample empirical evidence of the role of spatial discounting in such spatial variation, there are few theoretical studies that address spatial discounting of ecosystem services based on welfare economic theory. We establish a theory of spatial discounting that follows closely the concept of time discounting pertaining to climate change, and decompose spatial discount rates into consumption, ecosystem service, and willingness to pay numeraires. We consider and explain the role of key parameters such as pure rate of spatial preference, consumption change, ecosystem change, population density, and elasticity of marginal utility on the spatial discount rate. We find that the spatial discount rate of willingness to pay for ecosystem services that frequently appears in the empirical literature, is the difference between spatial consumption discount rate and ecosystem service discount rate. We use numerical simulations to illustrate how the three different spatial discount rates vary with the spatial distance from the ecosystem service and with consumption patterns. We then consider two specific cases of ecosystem service provision for public goods and private goods and illustrate how the spatial discount rate varies under these scenarios. The results from our study can be combined with previous work on time discounting to better inform the sustainable use of global ecosystem services.

Environmental injustice in Mexico City: A spatial-quantile approach
Alejandro LOME-HURTADO, University of York, UK
Julia Touza-Montero, Piran C. L. White

The majority of studies on environmental justice show that groups with lower socio-economic status are more likely to face higher levels of air pollution. Most of these studies have assumed simple, linear associations between pollution and deprived groups. However, empirical evidence suggests that health impacts are greater at high pollution concentrations. We investigate the associations of extreme levels of particulate matter up to 10 micrometers in size (PM10) and ozone with deprived conditions, children and elderly people in Mexico City. We use spatial quantile regression to analyse the association for each quantile of the range of pollution values, while also addressing spatial autocorrelation issues. Higher

levels of PM10 are significantly positively associated with deprived economic conditions and elderly people, and negatively associated with children, more strongly than for lower pollution levels. Conversely, higher levels of ozone are significantly negatively associated with deprived economic conditions and elderly people, and positively associated with children, more strongly than for the lowest quantile. These results demonstrate clear variations in the associations between pollution levels and vulnerable groups across the range of pollution levels in Mexico City, and provide important evidence for decision-makers addressing air pollution inequalities and injustice in Mexico City and other cities.

Logistical Details

The Conference Venue

The entire conference will take place within the **historic premises of Kings College** (founded in 1441 by Henry VI). It is one of the 31 colleges in the University of Cambridge and is renowned for its 'backs' overlooking the river Cam as well as its Chapel and choir. If you intend to attend the full conference we advise you to arrive in Cambridge on the 12th as the main Conference proceedings start at 8:45 a.m. on the 13th of Sep. Directions of how to get to Cambridge and to Kings College are provided at the end of this document. Once you arrive at the main entrance of Kings College please ask the **College porter** to direct you to the **Conference Office** which will be where you can collect your room key as well as any relevant printed information (programme, book of abstracts etc.). The **Conference Office** is located in the Scotts Building. The Office can also be used to store personal belongings if needed. Please note the following details regarding the scheduling of the event:

Wednesday 12th of September – Arrival date

Please go to the Conference office and collect keys. The office will be staffed from 2pm-8pm. Please let us know if you will arrive outside these hours. In this case, you will collect your key from the Porter's lodge located at the main entrance of Kings College. The porters lodge is open 24 hours a day so it is not a problem if you are delayed in getting into town. There are no day activities scheduled for the 12th of September so you may wish to take the opportunity of strolling around the historic city centre. Details of places to visit, restaurants, pubs etc. can be found at:

http://www.cam.ac.uk/cambarea/tourist/ or here http://www.visitcambridge.org/visitor-information. Details about the history and features of Kings College can be found at:

http://www.kings.cam.ac.uk/visit/index.html

Visiting the historic Chapel at Kings: though there is no mass or choir in September you are welcome to visit the Chapel (access is free for conference delegates if you are wearing your conference badge).

A welcome reception will be held at 6pm on the 12th in Kings College (in the courtyard weather

permitting). This will be concluded by 7:30 pm so that delegates can stroll into the nearby historic city centre to explore the local restaurants and pubs.

Thursday 13th – Friday 14th - Main Conference

Location

The conference takes place in the **Scotts** and **Keynes Buildings**. The main Dining Hall is located in the **Wilkins Building (see map attached)**. Your dietary requirements should have been requested during online registration. There is no formal dress code for the conference banquet dinner. The conference venue will also have an **exhibition area** (close to the coffee break location) where delegates are free to pin up posters or display flyers, books, policy reports etc.

Scientific programme

The full scientific programme and papers will be uploaded on the Conference website at:

http://www.bioecon-network.org/pages/20th%202018/20th_2018.html

Each conference day commences with one keynote address. This year's speakers are **Professor Douglas Gollin**, University of Oxford and **Professor Paul Ferraro**, John Hopkins University.

The scientific programme consists of **parallel sessions** with academic papers. Each paper presented is allocated a 30 minute slot of which 20 minutes are for the presentation by the author, 5 minutes for comments by the designated discussant and the remaining 5 minutes for other questions, exchanges and comments.

The conference programme also includes **special policy sessions** that are run by the policy organisations that support BIOECON. The policy sessions keep with the spirit of the BIOECON network which aims to bring together the academic and policy communities that work on the economics of biodiversity conservation. These sessions aim to critically evaluate current scientific knowledge and identify knowledge gaps that should be filled in order to produce new and improved actionable and effective biodiversity policy recommendations. On the 13th the policy plenary session is entitled "Lessons learned (if any?) from experimental evidence for the development of REDD+" and will be chaired by Pr. Andreas Kontoleon. On the 14th the policy plenary session is entitled "Resilience, Natural Disasters and Insurance for Ecosystems" and is chaired by Dr Julia Touza-Montero.

Instructions for paper presenters, discussants and session chairs

The seminar rooms will be equipped with a laptop, power projector and screen.

Paper presenters are requested to upload their presentations on the seminar room's laptop 10 minutes before the start of their session.

Paper discussants: Most (if not all) paper presenters also act as discussant to another paper in their session. Please consult the programme to see if and which papers you are to discuss. Paper discussants are kindly requested to download the paper and prepare your comments. If you have any difficulties in downloading papers please notify Ms. Hannah Kettle at bioecon@bioecon-network.org.

Session chairs: Please consult the programme to see if you are chairing any sessions. If so please promptly proceed to the relevant seminar room and confirm that presenters and discussants are present. Please ensure that all speakers stay within the time limits. If there are any IT difficulties during the session please contact the Conference Registration desk. If you are unable to chair the session please inform the organisers as soon as possible.

Internet access, printing and other office services support

Details on how to access Wi-Fi within Kings College will be provided with your welcome pack. Printing facilities and other office support services are limited. Contact conference staff if you need such assistance and we will do our best to help.

Travel and local area information

Reaching Cambridge: From Stansted Airport: The rail station is beneath the airport. Trains run regularly from Stansted to Cambridge and take less than half an hour. For fares and timetable please see: http://www.nationalrail.co.uk/. Once at the Cambridge station, King's College is a short taxi ride

away. Alternatively you can take a bus to the city centre (5-10 minutes) and then Kings College is a few minutes walk away (see http://goo.gl/maps/Z3CO)

There is also a direct coach service from/to the airport: http://www.nationalexpress.com/

From Heathrow Airport: Upon arriving at Heathrow Airport there is a direct coach service from the Central Bus Station to the centre of Cambridge. The Central Bus Station is well signed and coach tickets for all services can be purchased from the Travel Centre in the station. If you prefer to pre-book your ticket, or wish to check timetables or fares, this can be done at www.nationalexpress.com.

Coaches leave Heathrow approximately every 30 minutes, and take approximately 2.5 hours to reach

Cambridge. Coaches arrive at Cambridge Parkside stop in central Cambridge**.** King's College is then a short taxi ride away (taxis can be normally found at the bus stop) or alternatively a 20 minute walk. See map for walking path: http://goo.gl/maps/j62F

From other airports: Coaches are also available from Gatwick to Cambridge (4 hours) and Luton to Cambridge (1.5 hours). They also arrive at the Cambridge Parkside stop

From Central London: Trains are available to Cambridge from Kings Cross Station (approximately 1 hour) and Liverpool St Station (1-1.5 hours). See http://www.nationalrail.co.uk/ for further details. King's College is a short taxi ride away from the from the train station (approx. 5-10 minutes).

By Road: Local road connections can be found at

http://www.kings.cam.ac.uk/images/general/roadmap1.jpg

Please note that the College has no parking spaces. The town car parks are a relatively short distance from the College, but do allow extra time for parking since the city is always busy. For details on car parks, see: https://www.cambridge.gov.uk/car-parks-map

Taxi from airports: Especially if you are travelling in groups it may be worth looking into sharing a taxi into Cambridge from the airport you will be landing at. Price and booking details can be found at:

http://www.airportlynx.co.uk/

http://www.panthertaxis.co.uk/

http://www.mastercab.co.uk/

http://www.camtaxiairport.co.uk/

Additional nights accommodation:

If you require additional nights accommodation you can book these via the online booking site:

http://onlinesales.admin.cam.ac.uk/browse/extra_info.asp?compid=1&modid=2&deptid=113&catid=1002&prodid=1391

The costs for additional nights will be at your own expense. If you have any additional accommodation requirements please contact Ms. Hannah Kettle at bioecon@bioecon-network.org.

There is no guarantee that we can accommodate extra nights at Kings College as the premises are booked for other events all that week. If a room cannot be found you can book a room in another College here http://www.cambridgerooms.co.uk/ or a hotel room or B&B using the information provided here:

http://www.cambridgebedbreakfasts.co.uk/

http://www.accommodation.cam.ac.uk/VisitingCambridge/Listings.aspx

Conference Sponsors

The conference is organised jointly by the Department of Geography and environment at the London School of Economics, and the Department of Land Economy at Cambridge University.

The Department of Geography and Environment offers the opportunity to study Human Geography, Economic Geography and Environmental Economics and Social Science/Policy in a university with a worldwide reputation as a centre of academic excellence in the social sciences. Our courses are designed to benefit from and complement the strengths and aspirations of the LSE. We are highly regarded both nationally and internationally. In 2018, the QS World University rankings rated us 2nd globally for Geography. We have had 3 holders of the highly competitive Philip Leverhulme Prize Fellowships for researchers under 36.

We are a medium-sized Department with major specialities within the economic, development, urban, regional planning and environmental social science aspects of Geography, all with a strong emphasis on application and policy issues.

The **University of Cambridge** is one of the world's foremost research universities. The University is made up of 31 Colleges and over 150 departments, faculties, schools and other institutions. Cambridge has many notable alumni, including 90 Nobel laureates who have been affiliated with it. The **Department of Land Economy** is a leading international centre, providing a full programme of taught courses and research groups focusing on the law and economics of property, spatial planning, and environment.

The **Centre for International Environmental Studies (CIES)** at The Graduate Institute was established in 2010 for the purpose of developing political, legal and economic discourse on problems related to the global environment. It is dedicated to the better understanding of the social, economic and political facets of global problems related to the environment. CIES is also intended as a focal point for studies on the role of international institutions and governance in the resolution of international environmental problems for the Institute, Geneva, and the wider academic research community

CMCC's mission is to investigate and model our climate system and its interactions with society to provide reliable, rigorous, and timely scientific results to stimulate sustainable growth, protect the environment, and to develop science driven adaptation and mitigation policies in a changing climate.

MAVA's missions is to conserve biodiversity for the benefit of people and nature by funding, mobilising and strengthening our partners and the conservation community.

MAVA's vision is of a future where biodiversity flourishes, especially in the Mediterranean, coastal West Africa and Switzerland; the global economy supports human prosperity and a healthy planet; and the conservation community is thriving.

The British Academy is the UKs national body for the humanities and the social sciences – the study of peoples, cultures and societies, past, present and future. It has three principal roles: as an independent fellowship of world-leading scholars and researchers; a funding body that supports new research, nationally and internationally; and a forum for debate and engagement – a voice that champions the humanities and social sciences.

Launched in January 2018, *Nature Sustainability* is an online-only monthly journal publishing the best research about sustainability from the natural and social sciences, as well as from the fields of engineering and policy.

The Alexander von Humboldt Foundation promotes academic cooperation between excellent scientists and scholars from abroad and from Germany. Their research fellowships and research awards allow people to come to Germany to work on a research project together with a host and collaborative partner. If you are a scientist or scholar from Germany the foundation can support and help carry out a research project abroad with the researcher as a guest of one of more than 29,000 Humboldt Foundation alumni worldwide - the Humboldtians. As an intermediary organisation for German foreign cultural and educational policy we promote international cultural dialogue and academic exchange.

The **European Association of Environmental and Resource Economists** (**EAERE**) is an international scientific association which aims are: a) to contribute to the development and application of environmental and resource economics as a science in Europe; b) to encourage and improve communication between teachers, researchers and students in environmental and resource economics in different European countries; and, c) to develop and encourage the cooperation between university level teaching institutions and research institutions in Europe.
Founded in 1990, EAERE has over 1200 members in 80 countries from Europe and beyond, from academic institutions, the public sector, and the private industry. Interests span from traditional economics, agricultural economics, forestry, and natural resource economics. EAERE through its Journals,(ERE REEP, its Annual Conference, Summer Schools, and other activities provides many fora for exchanging ideas relevant to the allocation and management of natural and environmental resources.

The Economic and Social Research Council (ESRC) is part of UK Research and Innovation, an organisation that brings together the UK's seven research councils. The ESRC is the UK's largest organisation for funding research on economic and social issues.

About BIOECON

BIOECON (**BIOdiversity and Economics for Conservation – BIOECON**) is an interdisciplinary network aiming to advance economic theory and policy for biodiversity conservation. BIOECON assembles economists, lawyers and scientists from leading international academic and research institutions and main policy organisations working on design and implementation of cutting edge economic incentives for biodiversity conservation.

The network is the outgrowth of a project supported by the European Commission under the Fifth Framework Programme contributing to the implementation of Key Action 2: Global Change, Climate and Biodiversity within the Energy, Environment and Sustainable Development Programme. After its conclusion, the partners have continued to operate the conference in recognition of the large group of students and academics interested in working in this field, and in recognition of the need for a forum for their work. Over the past ten years, the network and conference has also served as a forum for policy organisations and government analysts to gather and to consider biodiversity and conservation issues as well.

In 2011 the Network was institutionalised, enlarging its partnership to outstanding institutions and research centres all over the world, working on biodiversity issues under different perspectives, reaching thus the number of thirty members.

The principal aim of BIOECON is to investigate the economic and policy driven forces responsible for decline of biodiversity, and accordingly, to develop and implement tools, i.e. incentive mechanisms, that could halt if not reverse the effects of these forces.

BIOECON wants to encourage: (i) to utilise a multidisciplinary approach to assess the social forces behind biodiversity change; (ii) to assess the ecological and socio-economic consequences of this change, (iii) to comprehend the interplay of these consequences; and (iv) to provide concrete policy responses for addressing biodiversity change. These overarching aims are pursued via individual projects developed within the network partnership on all three levels of biodiversity, namely the genetic, species, and ecosystem level.

BIOECON serves as a catalyst to spread the main results of research and practices on these themes, through a series of activities, amongst which its annual meeting, that represents an opportunity for networking, and sharing lessons and experiences with other researchers, environmental professionals, international organizations and policy makers.

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