

An aerial photograph of a landscape. A winding river flows through the center, surrounded by green vegetation. To the left, there are rectangular agricultural fields in shades of brown and yellow. In the bottom left corner, there is a large circular pond area with several smaller circular ponds. The title 'Land-Use Change' is overlaid in white text on a green background in the upper right.

# Land-Use Change

Cambridge Forum  
for Sustainability and the Environment

2



## Cambridge Forum for Sustainability and the Environment

**A rising world population, declining resources and a changing climate are all reshaping where we live and how we live. So how do we respond?**

This key question is the focus of a new Forum in the University of Cambridge which aims to stimulate cross-disciplinary conversations about some of the planet's most pressing global sustainability challenges and to bring fresh ideas and perspectives to research which will help to prepare for and address those challenges.

On a global scale, we need to find a way in which 7 billion people, expected to rise to 8 billion by 2030 and 9.6 billion by 2050, can live a high quality of life that is less demanding on our planet. And to adapt, be efficient and be sustainable, we need to know where to place our energies – nationally and globally – to meet the challenges the future will bring. Unfortunately there is no silver bullet: the solutions will need to be 'multi-pronged' and multi-disciplinary, requiring knowledge from many different sources.

'Sharing the knowledge' and catalyzing those connections are two of the goals of the Forum, which is Chaired by Professor Lord Martin Rees and has 25 core members who work in areas ranging from energy, biodiversity and food security to anthropology, architecture, history and economics.

One of the Forum's aims is to bring people together who would not usually meet each other but who are working in areas which overlap enough to stimulate an interesting discussion. Each month, during term time, three expert 'witnesses' are invited to help us to explore a particular area. They tend to be from outside Cambridge and, by inviting a rich mixture of policy and decision-makers from governments, researchers and business and technical experts, the Forum aims to derive fresh and innovative perspectives and generate new trans-disciplinary research questions.

### Our themes

The general theme of all the Forum discussions is 'sustainability in an uncertain future' and specific topics change each academic year. In our first year, we brought together a rich mixture of policy and decision-makers, technical experts and researchers to talk about sustainable cities. In October 2014, our focus shifted to a second topic, 'Land-use change', which aimed to stimulate connections between three of the University's Strategic Initiatives: Cambridge Conservation Initiative, the Cambridge Global Food Security Initiative and Energy@Cambridge. During these meetings, we explored the challenges we face as we place ever increasing and sometimes competing demands on land and natural resources.

### Since the Forum was founded in January 2013:

47	160+	60
Core members of the Forum and...	People from the University who have been drawn from...	Departments, centres and institutes have come to...
45	77	120+
Forum meetings involving...	Expert witnesses and...	External guests

### Forging new connections

The aim of our topic between October 2014 and June 2015 was to draw connections between food security, biodiversity and bioenergy and to use the meetings to think about the research pathways that will help us to prepare for and address the challenges we will face in the future. During these meetings, we explored the challenges we face as we place ever increasing and sometimes competing demands on land and natural resources.



Between October 2014 and May 2015:

23

Expert witnesses, including business representatives from Lend Lease and Microsoft Research, policy experts from the Joint Research Centre (JRC) and BirdLife International, the chief scientist of the Forestry Commission and people from...

41

university departments, Centres and Initiatives and...

220+

people came to our Science Festival event 'From bean to bar', where the CEO of Hotel Chocolat joined a plant scientist and a chemical engineer to explore the future of chocolate

## Meeting themes

### Laying the groundwork

In May, a meeting brought together representatives from three Strategic Initiatives in the University: the Cambridge Conservation Initiative, the Global Food Security Initiative and Energy@Cambridge. The aim was to stimulate a discussion about research gaps that connect biodiversity, ecosystem services and agriculture.

This meeting was then used to identify a series of themes that helped to shape our discussions between October 2014 and June 2015. Each of the nine monthly meetings included external and internal witnesses and guests who provided their perspectives on different facets of this area.

### Taking a global view

The October meeting was the first of the series and the aim was to take a global view of the pressures and drivers of land-use change and to help lay the foundation for the rest of the year.

**Ariel Brunner**, the Head of EU Policy at BirdLife International travelled over from Brussels to help us to start to think about how biodiversity connects to the other elements of this topic. He joined **Tina Barsby**, the CEO of the National Institute of Agricultural Botany (NIAB) in Cambridge who focused on food security and agriculture and **Paul Dupree**, Professor of Biochemistry in the Department of Biochemistry who discussed research into the development of sustainable biofuels that do not adversely affect the food chain.

### Drivers of demand

In November the aim was to consider some of the pressures from the demand side including economics, politics and health.

**Ian Bateman**, Professor of Environmental Sciences at the University of East Anglia came to help us to think about how to bring the environment into everyday decision-making, both by informing government policy and by ensuring that prices reflect the true resource costs of production. He joined **Bojana Bajželj** who leads the land-use components of the BP FORSEER modelling project in the Department of Engineering and has been exploring linkages between our diet, food security and climate change and Professor **Theresa Marteau**, the Director of the Behaviour and Health Research Unit (a Department of Health funded policy research unit), who is particularly interested in our diets, the choices consumers make and their health.

### What can we tell from above?

In December the theme for the third meeting was 'what we can tell from the sky?' Three witnesses helped us to consider the kinds of data sets we can use to look at land use, land-use change and links between these and policy implementation.

**Alan Belward**, the Head of the Land Resource Management Unit at the EC Joint Research Council, considered land-use change and remote sensing in Africa. **Lucas Joppa**, from Microsoft Research, discussed the data we do not have concerning future land use, and asked, 'who owns what land and for what purpose?' They were joined by **Jon Hutton**, the Director of the United Nations Environment Programme World Conservation Monitoring Centre who is interested in both the data sets themselves and in how to link them to policy at a national and inter-governmental level.



## Changing how we think

In January the fourth meeting asked whether the way we think needs to change. The three witnesses helped us to explore new ways of thinking about the impact of land-use change on the supply of natural resources and drivers behind the demand for them.

**Charles Godfray**, Hope Professor and Director of the Oxford Martin Programme on the Future of Food at Oxford University, explored how the global food system will need to change and adapt to the challenges facing humanity in the future, and in particular the concept of sustainable intensification and the relationship between food production, ecosystem services and biodiversity. **Georgina Mace**, Professor of Biodiversity and Ecosystems and Director of the Centre for Biodiversity and Environment Research (CBER) at UCL, discussed changes in the perception and goals of nature conservation. They were joined by **David Nally**, a Senior Lecturer in Human Geography in the Department of Geography, who spoke about how food security debates are framed and how recent changes to the global policy landscape will affect agrarian land use.

## Cotton - from source to shop

In February, at the fifth meeting, multi-national companies brought a business perspective to our discussion. Cotton was used as a case study to look at how companies respond to the demands being placed on their supply chains and the challenges to be overcome for businesses to remain successful and sustainable.

We co-hosted this meeting with the Natural Capital Leaders Platform at the Cambridge Institute for Sustainability Leadership (CISL) who are developing a cotton focus for their Platform Members. This work also relates to the ESRC-funded Nexus Network, which CISL is leading in collaboration with the University of Sussex and UEA.

## From local to global

The sixth meeting in the series, held in March, moved from the global level to explore questions that focus on the impacts of changes in land use, climate change and the demand for resources at a local level.

**Dame Barbara Stocking**, the President of Murray Edwards College discussed land grabbing whilst providing a practitioner's view of the connections between land use, food security and climate change. Dr Toby Gardner from the Stockholm Environment Institute explored some of the issues around 'the tropics in transition' and how our increasingly globalized and interconnected world is driving rapid processes of change across tropical developing nations, with myriad and hard to predict outcomes. **Professor Tim Wheeler** is the Deputy Chief Scientific Adviser at the UK Department for International Development, and he was interested in how climate change could impact on the sustainability of agriculture and food and has carried out research in a range of countries including Bolivia, Honduras, The Gambia, Uganda, China and India.

## Looking into the future – wood

In April, the seventh meeting focused on a specific resource, wood, and how its use may change while links were explored between innovation and design and the future supply and demand for natural materials.


**Professor Peter Freer-Smith**, the Chief Scientist for Forest Research and Forestry Commission, brought a 'supply side' perspective to the discussion and explored trends in planted forests. **Jon Kirkpatrick** is the Head of Sustainability, Europe, for Lend Lease and he works primarily on significant urban projects across Europe including regenerating over 28 acres across three sites at the heart of Elephant & Castle in the heart of London. **Michael Ramage** from the Centre for Natural Materials Innovation began by talking about why architects and engineers need to move beyond thinking about tall buildings in terms of steel and concrete. Then he discussed some of the work that he and his group are doing to develop new sustainable applications for renewable, energy-efficient and plant-based natural building materials.

## Through an East African lens

The last meeting took place in May and built on themes from previous Forum meetings to explore questions related to the food security and future of agriculture, livelihoods and biodiversity conservation in the region. The meeting was co-hosted with the Global Food Security Initiative and the Cambridge-Africa Programme.

**Liz Watson** from the Department of Geography discussed food production and the challenges it faces in the region, particularly agricultural systems which include smallholders and livestock managers (pastoralists). **Tinashe Chiurugwi**, a Research Associate from the National Institute of Agricultural Botany (NIAB) is interested in crop development and technology transfer in Africa. **Alison Mollon** is the Acting Head of the Africa and Madagascar Regional Programme at Fauna and Flora International (FFI). She drew on examples from the programme to discuss conservation landscapes and critical habitats in sub-Saharan countries and how projects can generate incentives for local communities which encourage sustainable use of sensitive habitats and species and create mechanisms to support the management of communal areas of land, coast and sea.





**‘Ecosystems buffer people from natural hazards, storms, floods, droughts and heatwaves, they provide resistance to pests and diseases. So this dominant focus on the provisioning services, food, water and energy, has come at a cost, and that cost is seen in less resilient ecosystems.’**

**PROFESSOR GEORGINA MACE, UNIVERSITY COLLEGE LONDON**

**‘As the climate changes we’re going to change our land use, but that change of land use will have secondary effects on a plethora of systems. How do we make better decisions about this?’**

**PROFESSOR IAN BATEMAN, UNIVERSITY OF EAST ANGLIA**



## Taking a global view



### Research gaps

The aim of this first meeting was to help lay the foundation for the rest of the year by taking a global view of the connections between food security, biodiversity and bioenergy. The three witnesses used their research and interests to think about some of the research pathways that will help prepare for and address these future challenges.

**Dr Tina Barsby** talked about ways in which the market drives research, particularly with regards to which crops get on to the market and how. She argued that there is a tension and a gap between the commercial value of supply and the public demand for crop varieties. Balancing populations demands for energy and food security will increasingly demand local solutions for local people so she was very interested in participatory plant breeding and how to help farmers with the collection and preservation of genetic diversity. Many new crops are developed for commercial purposes so she calls for more research into ways to transfer technology developed for commercial gain into non-commercial areas. She highlighted 'orphan crops' such as sweet potatoes, cassava, bananas which reproduce vegetatively and are locally important but where relatively little work has been done.

In his introduction, **Ariel Brunner** outlined some of the tensions between agriculture and biodiversity, between asking questions about both of these at global compared to local scales and between the perceptions and needs of the developed and the developing world. He argued that although there is a real interest in sustainable farming and in sustainable intensification, more research is needed into what these mean in practice and what impact they would have on biodiversity and ecosystem services.

**Professor Paul Dupree** argued that there is huge potential for creating biofuels from the sugars in plant cell walls. For example, it is now feasible to convert these sugars into ethanol and this is becoming more economically viable. He recommended research focused on the opportunities for renewables using waste materials. New methods to produce these fuels would part of this. However, he wondered what the effects of developing these technologies could be on land use and on the land itself, particularly if those waste materials, such as straw, are ploughed back into the soil to improve its condition.



## Wicked problems and questions generated by the open discussion

**There were strikingly different views about the role that technological advances such as genetic modification (GM) could play in offering 'solutions'.** Some saw genetics as the solution to problems of food security and environmental degradation (i.e., we can just use genetic tools to breed better crops that use fewer chemical inputs); whereas others saw GM as one of the major threats to both of these (i.e., the success in creating high-yielding crops has narrowed our diet to a few crops which are inbred and require uniform environmental conditions and high inputs). Technological fixes are never as straightforward as is initially imagined but we were left asking how can we reconcile these very different views about the role of technological solutions in the future of agriculture.

**What sustainable farming is and what it means in practice for biodiversity and the environment as well as for the crops themselves** was first raised here and kept coming up throughout the year.

**Are we complicit in optimising a food production system that needs fundamental change** or should we all continue on a path that makes 'baby steps' that we hope will collectively shift us in the right direction? In other words, how do we find questions that are narrow enough to allow real research but that answer the bigger problems that clearly cannot be addressed through the sum of small improvements?

**Food security today is a local, not a global issue**, so how can we bring scale into this discussion and develop holistic sustainable farming scenarios for specific locales?

## Witness profiles

### Dr Tina Barsby

Chief Executive, The National Institute of Agricultural Botany (NIAB), Cambridge

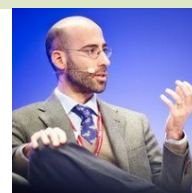
Dr Barsby was appointed Chief Executive and Director of NIAB in September 2008, becoming the first female Chief Executive in the Institute's 90-year history. As a plant geneticist she has extensive experience in plant biotechnology and applied plant science, spanning both academic and commercial research in the agricultural crop sector, including 18 years with Groupe Limagrain. She has extensive scientific experience in biotechnology and seed development, especially in wheat and oilseed rape, and has been involved in various cross-sector activities bringing together scientists and breeders.



### Ariel Brunner

Head of EU Policy, BirdLife International

Based in Brussels, Ariel Brunner is Head of EU Policy at the environmental NGO BirdLife International. In recent years, he has led BirdLife's work on reform of the European Union common agriculture policy, better implementation of the EU rural development policy and advocating the sustainability of biofuels and bio-energy policies. Before moving to Brussels he followed the implementation of EU nature conservation legislation in Italy and was instrumental in the designation of the country's special protection areas network (sites protected under the EU Wild Birds Directive).



### Professor Paul Dupree

Professor of Biochemistry, Department of Biochemistry, University of Cambridge

Professor Paul Dupree's research is focused on understanding the biosynthesis and function of polysaccharide components of the plant cell wall. He has made significant advances in the area of understanding and improving plant lignocellulosic biomass quality and quantity, research which underpins development of renewable materials, such as fuels from plants. The Dupree Lab is one of the six research hubs in The BBSRC Sustainable Bioenergy Centre. This virtual centre is composed of academic and industrial partners, based at each of the Universities of Cambridge, Dundee, Nottingham and York and Rothamsted Research. Their contribution is the BSBEC Cell Wall Sugars Programme - developing strategies to improve plants and enzymes for increased sugar release from biomass.





## Drivers of demand



14th November 2014

### Research gaps

In his introduction, **Professor Ian Bateman** assumed that our ultimate objective is to ensure non-declining wellbeing over time. He admitted that this seems negative, but argued that as people's long-term welfare depends on natural systems, focusing on human wellbeing means that those natural systems have to be safeguarded. He focused on three main topics.

First, more research is needed both into the supply side of good – the role of land management, GM, agritech and precision agriculture – and the demand side and the role that spatial and temporal variation in economic drivers and their impacts will play. Second, we must consider the impacts of choices we make on the environment. A lot of research currently concentrates on adaptation but not enough on the dynamics of adaptation and the secondary effects those will have. For example, how will people respond to the changes in climate and how will those responses change land use and water availability? Finally, we must try to make better decisions based on what we know about supply, demand and impacts. Economics has an important part to play, both in how we build 'value' into models (as opposed to price) and how we use those models to make decisions. He argued that developing truly integrated models that combine natural sciences, economics and policy and include both temporal and spatial dimensions of changes in natural capital will also be crucial.

**Bojana Bajželj**'s models indicate that future demand for natural resources is substantially higher than future supply. Her future research questions focused on finding alternatives to expanding agricultural land such as reducing agricultural waste and ways to value non-agricultural land. She also asked whether sustainable intensification has the potential to close the yield gap and this question was a recurring theme over the year.

**Professor Theresa Marteau** focused her introduction on demand and behaviour change and ways in which our behaviour is driven by immediate gratification and the environment we live in. She argued that there is an inevitable tension between generating wealth – selling us goods we do not need – and generating planetary health and human health. Further research related to shifting consumption and changing behaviour needs to be connected to the politics, economic, commercial and philosophical issues surrounding why and how these choices are made.



## Wicked problems and questions generated by the open discussion

**How far can models be expected to answer questions related to sustainability?** Do we push them too far and expect too much of them? Not everything can be modelled, so what happens when there are elements of a system that are important drivers of change or influencers but nonetheless cannot be included?

**The dangers inherent in simplifying complex systems versus the need to do it,** both in order to construct models and explain what we see in the world and to be able to communicate messages about sustainability.

Discussions about consumer choice and behaviour highlighted **inherent tensions between some of the questions that researchers want to answer and those of interest to companies and retailers.**

What are **the impacts of alternative land-use strategies and how can land be used more intelligently?**

At the moment, **we are not rewarding and valuing other uses of land in the same way as land used for agriculture** - how could we address this?

**How will people's affluence change their behaviour?** How will that change diets and land use?

**What are the 'levers' for changing people's behaviour** towards making more sustainable choices?

## Witness profiles

### Professor Ian Bateman

Professor of Environmental Sciences, School of Environmental Sciences, University of East Anglia

Ian's interests lie in attempting to achieve economic reform by bringing the environment into everyday decision-making at all levels. Much of his research therefore seeks to value the true cost of pollution and the true worth of environmental improvements. He is the Director of the Centre for Social and Economic Research on the Global Environment (CSERGE), based at the University of East Anglia. It is a leading interdisciplinary research centre in the field of sustainable development and decision-making. Recently completed research projects include: ChREAM (land use), AQUAMONEY (water quality) and VERHI (impacts on child health).



### Bojana Bajželj

Doctoral Researcher, Low Carbon & Materials Processing Group, Department of Engineering, University of Cambridge

Bojana is interested in the global food security, climate change and land use. Her research points to the importance of addressing food waste and sustainable diets from a climate mitigation perspective. She is also contributing to the resource-nexus model called Foreseer, integrating a range of land-related topics: urbanisation, agricultural production, biodiversity and the role of land in global carbon and water cycle. Before joining the University of Cambridge, Bojana worked as environmental consultant. She holds an MSc in Environmental Technology from Imperial College London and a degree in Landscape Planning from University of Ljubljana.



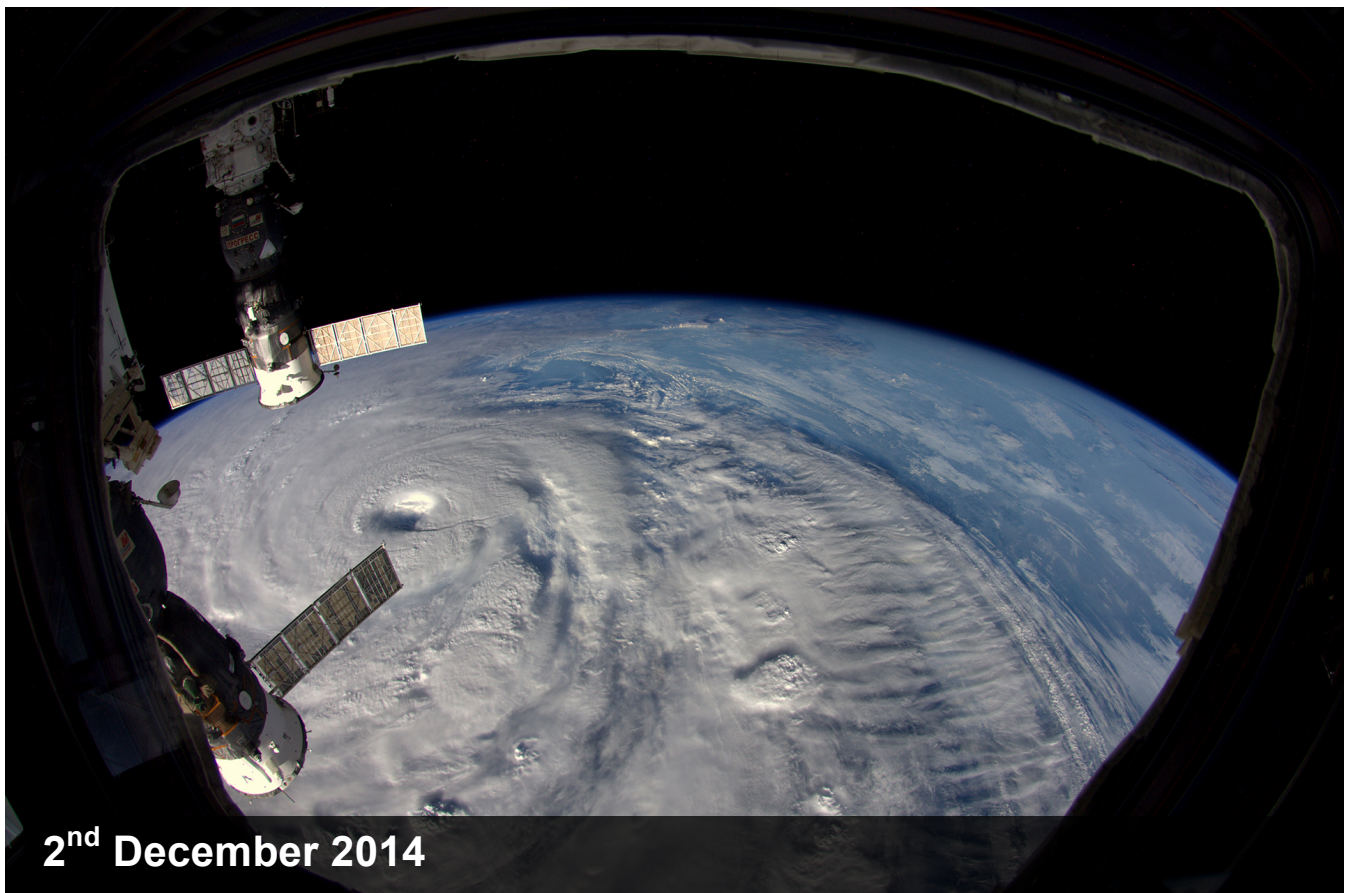
### Professor Theresa Marteau

Director of the Behaviour and Health Research Unit, Institute of Public Health, University of Cambridge

Theresa is director of the Behaviour and Health Research Unit, the Department of Health funded policy research unit in behaviour and health. She is also Professor of Health Psychology at King's College London and Director of the Centre for the Study of Incentives in Health (with the London School of Economics and Queen Mary, University of London). She studied psychology at the London School of Economics and Political Science and the University of Oxford. Her current research focus is on developing ways of changing behaviour at population levels, drawing on neuroscience, behavioural economics as well as psychology.



## What can we tell from above?



2<sup>nd</sup> December 2014

### Research gaps

This was the third meeting in the series and the three witnesses helped us to think about the kinds of data sets we can use to look at land use and land-use change and links between these and policy implementation.

**Dr Alan Belward** began his introduction by highlighting the rapid advances in remote sensing technology, which have been driven by the democratization of space, increased resolution of satellite images (from 80m to 30cm) and free and full access to satellite data archives. These open up for new possibilities for research and mean that we have huge capability to obtain high-resolution data. However, our ability to understand change on a global scale is still limited, and he identified the three main gaps in our knowledge related to land use and land-use change: the nature of land cover, the nature of land use and the nature of land ownership.

He added after the meeting that finding common ground between the observations and reporting standards of the three Rio Conventions – on Biodiversity, Climate Change and Desertification – would be hugely beneficial. Identifying commonality between them will help to determine the observations needed and to make policy links between biodiversity loss, desertification and climate change.

**Dr Lucas Joppa** focused on land ownership and difficulties associated with finding out who 'owns' a plot of land and who has rights to use it. Very high-resolution satellite image acquisitions provide some information about land use but in order to be able to understand the processes at work, physical data needs to be connected to human, social and institutional data. Finding ways to bring satellite data together with data from the ground, including characteristics of the land – soil type, climate, geographical features and ecology – and land tenure will provide a much more comprehensive picture of how land is being used now and in the future.

**Dr Jon Hutton** gave an overview of the challenges of collecting and interpreting remote sensing data in the specific context of biodiversity preservation. He argued that as habitat loss is the main driver for the loss of biodiversity in all (terrestrial) biomes, an understanding of changing land uses is imperative. He stressed that even though new technology, such as the instruments being used by the Copernicus Programme's Sentinel satellites, will allow us to measure future changes, our ability to quickly and effectively measure land-use change is lacking. This is both because land-use change outpaces our data collection and processing but also because we do not have an efficient and holistic approach for conducting retrospective analyses.



## Wicked problems and questions generated by the open discussion

**So many countries and companies are launching environmental satellites that harmonising and calibrating the data between them is very challenging.** One risk is that some of the changes we are looking for are very small and calibration problems may make those changes impossible to detect.

**A lot of the information we need to know about land-use change and climate change is fairly mundane** rather than cutting edge research attractive to academics (who need intellectual incentives) and companies (who need financial incentives). Who is going to do this boring but important research and who will fund it?

**How can we make sure that the 'haystacks' of data being collected is turned into something that can be measured or modelled** and contributes to both into policy and action on the ground?

**How can we enable 'cross-mapping' between different mapping projects**, such as between biodiversity mapping and land use, and ensure that data is collected consistently?

**How do we manage large data flows** and how do we deal with the fact that globally many existing datasets are not uniform?

**What data are missing** and what can we do now to lay the foundations for collecting it in the future?

## Witness profiles

### Dr Alan Belward

Head of the Land Resource Management Unit at the Institute for Environment and Sustainability, European Commission's Joint Research Centre (JRC) in Ispra, Italy

Alan leads one of eight Units within JRC, which provides information for European and International policies and aims to balance competing land-use demands whilst securing access to natural resources and maintaining ecosystem services. In the 1990s he co-chaired the International Geosphere Biosphere Programme's Land Cover Working Group and chaired the Committee for Earth Observing Satellites (CEOS) Working Group on Calibration and Validation. From 2002 to 2006 he chaired the Global Climate Observing System's (GCOS) Terrestrial Panel and in 2009 he was appointed to the GCOS Steering Committee. He is a member of the NASA and USGS Landsat Data Continuity Mission Science Team and the European Space Agency's Sentinel-2 Mission Advisory Group and is also a visiting lecturer at the Technical University of Vienna.



Lucas' research combines science, policy, and tools and technology. This ranges from quantifying the impacts

### Dr Lucas Joppa

Head the Conservation Science Research Unit and a scientist in the eScience Group at Microsoft Research, based at the Microsoft Redmond Campus, USA

of conservation actions to unravelling the complexities of species interactions and mapping where species are being discovered and going extinct. He embraces the challenge of predicting outcomes for ecological communities in an increasingly uncertain environment and uniting robust ecological theory, social considerations and innovative distributed data collection systems to achieve effective environmental conservation. He is currently an Honorary Research Fellow at the University of Kent's Durrell Institute for Conservation and Ecology (DICE) and an Honorary Conservation Fellow at the Zoological Society of London (ZSL).



### Dr Jon Hutton

Director of the United Nations Environment Programme World Conservation Monitoring Centre in Cambridge

Jon received a doctorate in crocodile ecology from the University of Zimbabwe in 1984. During the next 20 years he held a number of senior management positions in that country, encompassing the government, NGO and private sectors. During the early 1990s he was one of the Zimbabwe Government's negotiators to the biodiversity-related Multilateral Environmental Agreements. In 1999, he moved to Europe to work as the Executive Director of Resource Africa and Fauna & Flora International's Director for Africa before joining UNEP. Jon has produced over 50 papers, books and conference proceedings covering issues such as conservation policy; wildlife management; protected area management; community-based natural resource management; the sustainable use of natural resources; and the relationship between conservation and poverty.



## Changing our thinking



### Research gaps

This month, the meeting asked whether the way we think needs to change. Our aim was to use the interests of the panel of three witnesses to explore new ways of thinking about the impact of land-use change on the supply of natural resources and drivers behind the demand for them.

**Professor Charles Godfray** focused on food production and stated that “now is the endgame on land allocation”. As a result production on existing land needs to be expanded through intensification. He argued that other competing land uses such as those for bioenergy production are not as important and should therefore be curtailed and food production through sustainable intensification must be prioritised. During the open discussion, he stressed that in his view, diet is a “small player” in the challenge to meet food demand. Instead, the macroeconomics of food and developing win-win scenarios for biodiversity and for food production should be our focus.

**Professor Georgina Mace** finds the current way of framing discussions about land use too narrow and argued that there is a need to put the discussion in a broader context that looks at the entire suite of benefits that we get from the land. She does not see the need to view biodiversity as something that we have to balance food production against. Instead, we need a more sophisticated view of both the demand side from society and the supply side from ecosystems and to find ways to overlay them onto each other at relevant spatial and geopolitical scales so that we can harness all the benefits that ecosystems can provide. She wants to see a renewed focus on the regulation and cultural benefits of ecosystems and how to manage these in conjunction with provisioning services to increase the capacity of landscapes to support resilient and productive human societies.

**Dr David Nally**’s introduction also focused on framing, particularly the framing of the global food security debate. He argued that myths surrounding food security overlook the underlying structural dynamic that causes hunger and starvation in the first place, indicating that the efforts are in the best case only treating the symptom of the problem – the amount of food available – and in the worst case making matters worse by assuming technology can fix the problem. He led a series of small group discussions in the Parallel Forum and they agreed that the assumption that ‘more people equals more requirement for food’ is a simplification and may even be used to make people fearful and justify inappropriate use of land.



## Wicked problems and questions generated by the open discussion

This month, **some argued strongly that addressing food distribution was crucial to food security whereas other meetings have focused more on food production or consumption.** Are we in danger wrestling with artificial distinctions and how can we think about questions and narratives that address and leverage change across all of them?

**Within any discipline, there is a tendency to simplify a solution and bring it into a framework that it is familiar with** so social scientists will generate one solution, political scientists another. If we are going to either look at a landscape scale or place-based solutions and policies, how can we escape from this way of thinking in silos and get to the heart of the problem?

**The ‘elephant in the room’ in food security discussions is always consumption.** This prompted David to ask whether development is about raising the floor or lowering the ceiling.

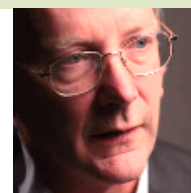
**Food supplies and markets:** how can we manage land to ensure that it delivers what it does best, at the right time and in the right place as well as providing other benefits?

**How do the local or the micro-level needs and issues of ‘sustainable intensification’ link with concerns at the global, macro level?** **Witness profiles**

### Professor Charles Godfray

Hope Professor and Director of the Oxford Martin Programme on the Future of Food at Oxford University

Charles is a population biologist with broad interests in the environmental sciences and has published in fundamental and applied areas of ecology, evolution and epidemiology. He is interested in how the global food system will need to change and adapt to the challenges facing humanity in the 21st century, and in particular in the concept of sustainable intensification and the relationship between food production, ecosystem services and biodiversity. He chaired the Lead Expert Group of the UK Government's Foresight Project on the Future of Food and Farming and is a member of the Strategy Advisory Board of the UK Global Food Security Programme and the Steering Group of the UK Government Green Food Project. He is also a member of the writing team for the UN's Committee on World Food Security, High Level Panel of Experts report on Climate Change and Food Security.



### Professor Georgina Mace

Professor of Biodiversity and Ecosystems and Director of the Centre for Biodiversity and Environment Research (CBER) at University College London (UCL)

Georgina joined UCL in 2012 from Imperial College where she was Director of the NERC Centre for Population Biology. Her research interests are in measuring the trends and consequences of biodiversity loss and ecosystem change. She led the development of criteria for listing species on IUCN's Red List of threatened species, and was a coordinating lead author for biodiversity in the Millennium Ecosystem Assessment. Recently she has worked on the UK National Ecosystem Assessment, was a co-investigator on the NERC Valuing Nature Network and Associate Director of the Ecosystem Services for Poverty Alleviation Programme, funded by DfID, NERC and ESRC. She is an NERC Council member, member of the Council of the Royal Society and Chair of the science committee for the DIVERSITAS global change research programme.



### Dr David Nally

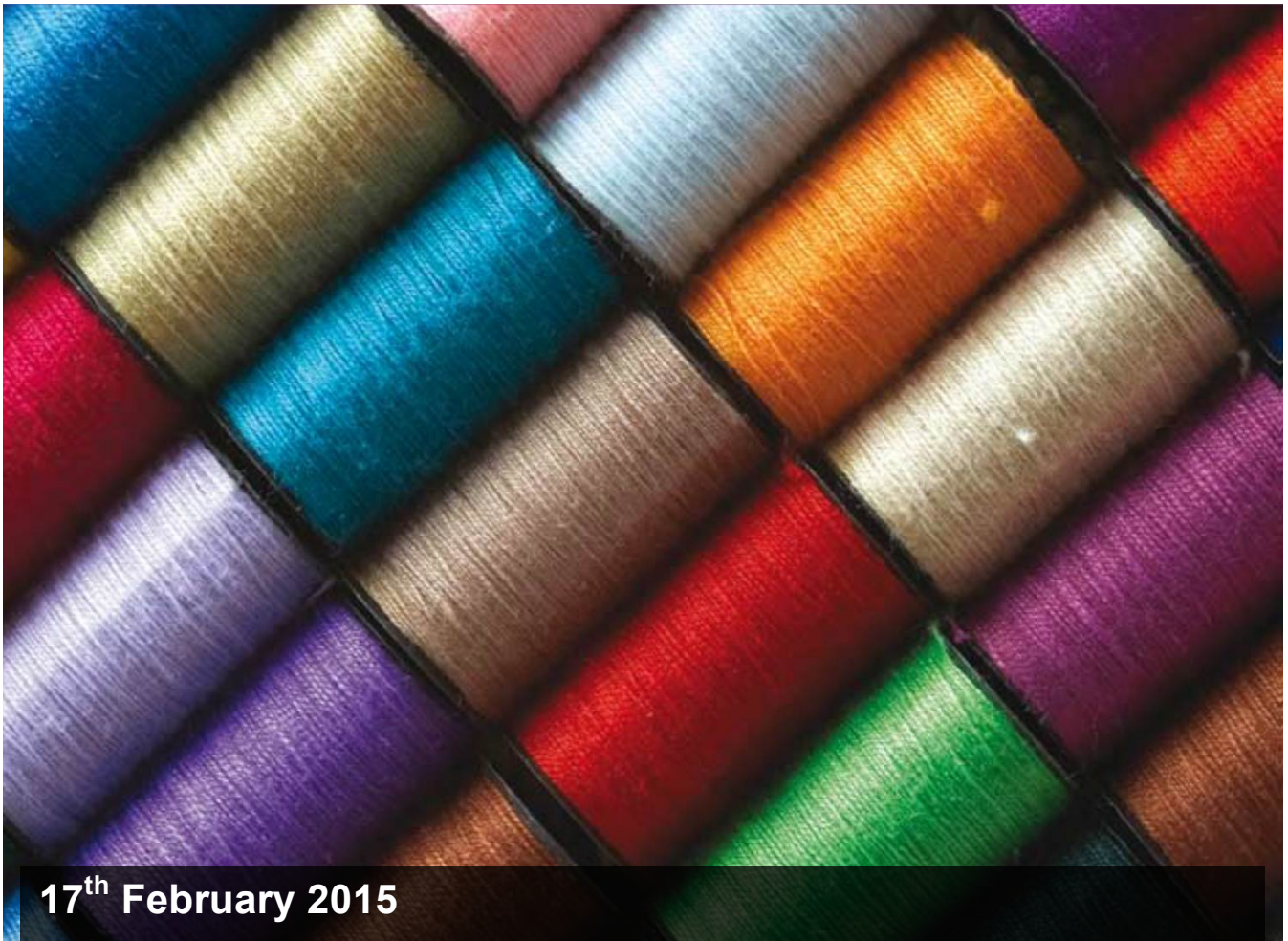
Senior Lecturer in Human Geography in the Department of Geography at the University of Cambridge

David is a human geographer and member of the Natures, Cultures, Knowledge and the Population, Health and Histories Research Groups. His research interests include the political economy of agrarian change; the economic and socio-cultural dimensions of colonisation; the history of subsistence crises; and the geopolitics of disaster relief. He recently completed a monograph, *Human Encumbrances: Political Violence and the Great Irish Famine* (University Notre Dame Press, 2011) and a co-authored textbook, *Key Concepts in Historical Geography* (Sage, 2014). David teaches courses on historical and contemporary human geography, research methods and the politics of hunger. He was the editor of the RGS-IBG's monograph series on Historical Geography from 2007–2011.





## Cotton – from source to shop



### Research gaps

For the fifth meeting, two multi-national companies brought a business perspective into this debate. Cotton was used as a case study to look at how companies respond to the demands being placed on their supply chains and the greatest challenges they can see on the horizon.

We co-hosted this meeting with the Natural Capital Leaders Platform at the Cambridge Institute for Sustainability Leadership (CISL) who are developing a cotton focus for their Platform Members. This work also relates to the ESRC-funded Nexus Network, which CISL is leading in collaboration with the University of Sussex and UEA.

**Dr Chris Brown** and **Dr Helen Crowley** highlighted the following challenges for the cotton and clothing industry:

- **Low customer awareness** of sustainability and environmental impacts compared to food commodities.
- **Supply chains are currently very opaque** and its complexity makes it very difficult to trace where a batch of cotton originates.
- **A lack of clarity about the impacts of different production systems** (organic vs. 'better' vs. conventional).
- **The lack of availability of financing systems to smallholder cotton farmers**
- **Organic cotton farming in general is declining as there is not enough support for farmers** and although there is a significant premium for it, smallholder farmers are not receiving that premium.
- **Developing meaningful impact indicators:** a reductionist focus on a particular issues such as food miles, organic foods or child labour makes it difficult to know how different aspects of the system connect together.

## Wicked problems and questions generated by the open discussion

**Where do we leverage to make cotton production better**, both for the environment and for the people who grow and harvest it?

**How can smallholder farmers get access to good quality seed** and what are the best seed varieties to grow in different areas?

**How can we unpick supply chains** and create new business functions that allow traceability throughout the cotton supply chain from source to shop?

**Choices about whether to choose organic or GM cultivation will become increasingly urgent as competition for land increases and land quality decreases.** Can we develop indicators to help us to determine the impacts of different cotton production systems on the environment – organic vs. 'better' vs. conventional – and to make direct comparisons between them?

**There are cost issues associated with organic cotton**, as it is more expensive than conventional cotton. What incentives would farmers need in order to grow it and how do these vary from one region to another?

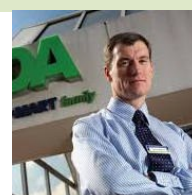
**Is it possible to broaden questions regarding sustainability so that we consider more generally whether a commodity like cotton is sustainable**, rather than just concentrating on cotton production?

## Witness profiles

### Dr Chris Brown

Sustainable Business Director at ASDA

Prior to his work at Asda, Chris worked in Government before joining the Meat and Livestock Commission as Beef Strategy Manager. He moved into retail as Agriculture Technologist with Marks and Spencer before joining Asda as Agriculture Development Manager with a remit to develop Asda's strategies and activities across all sectors of agriculture. His role has now been extended to become Head of Ethical and Sustainable Sourcing covering waste and resource management, communications and sourcing.



Asda is a British-based, American-owned supermarket chain, which retails food, clothing, general merchandise, toys and financial services. It also has a mobile phone network Asda Mobile. In 1999, Asda became a subsidiary of the American retail company Walmart and today is the UK's second-largest chain by market share.



### Dr Helen Crowley

Head of Sustainable Sourcing Innovation at Kering

Helen joined Kering as the Conservation and Ecosystems Services Specialist in November 2011. During her tenure at Kering, Helen has been advising and supporting their Luxury and Sport & Lifestyle brands with a focus on innovative cross-cutting sustainability solutions, including sustainable sourcing and manufacturing processes. Prior to Kering, Helen was Associate Director at the Wildlife Conservation Society for 11 years. She has a background in field-based conservation and development projects particularly in Africa and Madagascar, as well as market-based conservation initiatives and designing corporate-NGO partnerships. Helen has also worked as a consultant to several corporations where she was responsible for helping them implement sustainability strategies.



A family-controlled, listed company, Kering is a world leader in apparel and accessories, which develops an ensemble of powerful brands. Focused on a single business, they design, manufacture and market desirable products across two fast growing segments: Luxury and Sports & Lifestyle.





## From local to global



10<sup>th</sup> March 2015

### Research gaps

For the sixth meeting we explored questions that focus on the impacts of changes in land use, climate change and the demand for resources at a range of scales. All the witnesses agreed that despite the ever-increasing influence of global dynamics, local dynamics matter. They can have a profound influence on large-scale processes, yet they are often ignored.

In her introduction, **Dame Barbara Stocking** first focused on Kate Rayworth's 'doughnut' economic model where every person has the resources they need to meet their human rights, while collectively living within the ecological means of our planet. Kate joined the Parallel Forum over Skype to discuss this model with them in more detail. Barbara then turned to measures of growth and called for more research into finding alternatives to GDP and argued that the poorest people will be affected the most by changes in climate and thus need to be our focus.

**Dr Toby Gardner**'s introduction drew on the three approaches to sustainability of Chapin et al. – managing risks, building resilience to change and achieving transformation. He argued that researchers should consider the adage 'think global, act local'. The fact that we live in an increasingly interconnected world means that acting locally can influence global conditions whether or not we are 'thinking globally'. Using examples from his work in Brazil, he added that ricocheting effects across scales are overturning common assumptions – such as fast local dynamics shaped by slowly changing global drivers – and these need to be increasingly recognised and accounted for in our work.

**Professor Tim Wheeler** identified a number of evidence gaps regarding the utilisation of food, access to it and the stability of production and supply chains as well as how to scale this information and apply it to help people make decisions at a local level. Turning to the next generation of research questions, he highlighted the need to bring together different types of data – social, biophysical and economic – when modelling the impacts of climate change on food security.

## Wicked problems and questions generated by the open discussion

When talking about climate change or even sustainability, **how do we move from saying, 'this is somebody's fault' to 'this is happening, how are we going to solve these issues?'**

Reducing consumption has been a recurring theme this year and Barbara added to this the concept of de-growth where those who currently consume a lot, consume less. Many discussions focus on specific actions that individuals can make, for example eating less meat and using less energy to heat our homes, but **how do we put principles like this into practice on a large enough scale to make a tangible difference?**

**We only really touched on the role of power**, for example power relationships between different actors and the nexus of power and food in relation to consumption and enforcement. Toby argued that the models needed to disentangle power relationships are alien to those who model deforestation, for example, and vice-versa. How can we overcome these huge intellectual and methodological barriers?

Does **building resilience to physical, economic and social shocks into societies** also imply some degree of greater insulation between countries (or sectors) within the global system?

**How do you answer some of the big questions about food security** and encompass biophysical, economic and social behavioural aspects of it, without propagating all of the errors and uncertainties amongst each of those components?

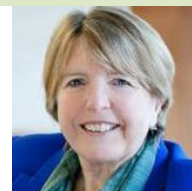
**Often scientists working at different scales have different ontologies or worldviews** i.e. solving global hunger vs. food sovereignty – how can we reconcile these views?

## Witness profiles

### Dame Barbara Stocking

President of Murray Edwards College, University of Cambridge

Dame Barbara Stocking became the 5<sup>th</sup> President of Murray Edwards College in July 2014. Prior to taking up her post, Barbara was Chief Executive of Oxfam GB from 2001 until 2013. During this time she led major humanitarian responses including the Horn of Africa and the West Africa food crises, as well as the Haiti earthquake, Pakistan floods and Tsunami. On campaigning, Barbara led Oxfam's work on Make Poverty History and more recently their work on climate change and the current Grow campaign on food justice in a resource constrained world. Barbara worked for eight years at the NHS, first as regional director for the South East of England, and then as the founding Director of the NHS Modernisation Agency. She was awarded a CBE for health services in 2000 and a DBE for humanitarian services in 2008, and was elected an Honorary Fellow of Murray Edwards College in 2010.



### Dr Toby Gardner

Research Fellow at the Stockholm Environment Institute, Sweden

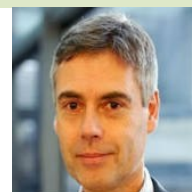
Toby Gardner's primary focus is on transitions towards more sustainable land-use systems in Brazil. He has over 10 years' experience in science and science-policy issues in human-modified landscapes across the tropics, with a strong emphasis on the management and conservation of biodiversity and ecosystem services in multiple-use agriculture-forestry landscapes and the challenges of balancing environmental concerns and rural development priorities. Before joining the Institute Toby was a research fellow at the University of Cambridge and helped found and coordinate the Sustainable Amazon Network. He has previously led research projects in Belize, Tanzania, and in Caribbean coral reef ecosystems and has authored more than 80 peer-reviewed publications.



### Professor Tim Wheeler

Deputy Chief Scientific Adviser at the Department for International Development and Professor of Crop Science at the University of Reading

At DFID, Tim provides science advice to Ministers and oversees the research portfolio of the Research and Evidence Division. He has extensive experience of working with policymakers in the UK and internationally and was Specialist Adviser to the House of Lords in 2010. Tim has published more than 170 scientific papers over the last 20 years on how climate change could impact on the sustainability of agriculture and food. His research group identified how temperature extremes reduce annual crop yields under climate change, developed novel ways of modelling climate change impacts on crops at a global scale and produced the first crop model to be coded within a global climate model to allow the study of land-surface-climate interactions over croplands.





## Looking into the future



### Research gaps

In the penultimate meeting of the series, we looked into a specific resource, namely wood. The panel of witnesses explored how shifts in the way we use wood may change in the future and by focusing on timber in buildings, we generated questions related to both forestry production and the kinds of materials that architects, designers and engineers will need.

**Professor Peter Freer-Smith** argued that the UK has moved from a past focus on woodland creation to an agenda driven by climate change adaptation and protection from pests and pathogens, which are both couched in terms of resilience. Climate adaptation work focuses on the silviculture of different species – the practice of controlling the establishment, growth, composition, health, and quality of forests to meet diverse needs and values – as well as the properties of the wood itself.

He finished by stressing the need to value woodlands not only in terms of the resource they provide, but also in terms of their conservation, their landscape, recreational value, forest protection, soil protection, water management qualities and even flood defence. If all of these are considered, the price may be a loss of production – is this one we are willing to pay?

**Jon Kirkpatrick** said that it is clear there are considerable sustainability and construction benefits to using timber. Although he agreed with Michael Ramage that some of the barriers to using more natural building materials are technical, he stressed that there are also considerable challenges associated with people's perceptions regarding whether such materials are a viable and competitive alternative to steel and concrete. In Jon's experience, some of these concerns are practical, such as fire risk, strength or durability that in turn impact mortgages and insurance. Others relate to economics, changes to the design and construction of the building and the environmental impact of the materials. This catalysed a discussion related to how the 'true' costs and benefits of natural material could be explored throughout the supply chain from where it is grown to where it is used.

**Michael Ramage's** new Centre aims to develop new sustainable applications for plant-based natural building materials such as bamboo and cross-laminated timber. Ultimately, he wants to use these materials like this to create skyscrapers more than 10 storeys high. When thinking about what these buildings will look like, he argued that a paradigm shift is needed in the way buildings are designed rather than simply applying steel and concrete-based design expertise. The properties, strengths and weaknesses of these new plant-based materials will allow architects to experiment and create new structural forms.

## Wicked problems and questions generated by the open discussion

**How can we measure the ‘true’ costs and benefits of using timber in construction**, including the impacts of material processing (such as glue), methane and carbon emissions during shipping and transportation? Even though the carbon emissions from shipping are low, would it be more sustainable to source it from as close as possible to the construction site rather than producing it in another country?

According to FRA 2015, planted forests make up 7% of the total global forest area but provide 45% of industrial round wood consumption. Peter argued that **planted forests could supply the bulk of our wood requirements and protect remaining natural forests**. Given changing uses, is this feasible?

**What tree species are needed to supply the timber for future buildings and where in the world will it come from?** The most productive trees are fast growing, such as eucalyptus, but how many and which aspects of construction do they suit? We tend to think about supply chains like this in global terms but would reducing the use of timber for paper really increase the supply of suitable grade wood for construction? As these forests already exist, can we – or should we – increase the use of such timber by material innovations?

**What are the barriers to using natural material in buildings and how can they be overcome?**

**Could the land sparing/land sharing debate be extended to forests and forest ecosystems?**

## Witness profiles

### Professor Peter Freer-Smith

Chief Scientist, Forest Research and Forestry Commission

As Chief Scientist for Forest Research and Forestry Commission, Peter ensures that Forest Research provides the scientific knowledge and expertise required to achieve sustainable forest management. He ensures advice to policymakers and practitioners is based on good scientific understanding and sound research and contributes to the formulation and implementation of the Forestry Commission's policies and objectives. His PhD was on the Impacts of Air Pollutants on Trees and was awarded by the University of Lancaster, where he also two periods of post-doctoral research before moving to a lecturer's post at the University of Ulster. In June 2005, Peter was appointed Honorary Visiting Professor in the School of Biological Sciences, University of Southampton.



### Dr Jon Kirkpatrick

Head of Sustainability, Europe, Lend Lease

Jon Kirkpatrick coordinates sustainability for Lend Lease across the EMEA region and acts as the central liaison for all sustainability issues across all of its business units. His role covers two essential areas, environmental operations plus associated performance and development innovation and strategy (both environmental and community investment). He works primarily on significant urban regeneration projects across Europe (such as Elephant and Castle & The International Quarter). He liaises closely with the development teams to focus on comprehensive urban and infrastructure problems, including finding solutions for renewable energy, water, waste, transport, biodiversity, green infrastructure and public realm issues through integration of sustainability into design. Before joining Lend Lease, Jon has experience across a wide number of major projects globally including the London 2012 Olympic Park and Education City in Qatar as an associate director of EDAW/AECOM.



### Michael Ramage

Senior University Lecturer, Department of Architecture, University of Cambridge

Michael Ramage is an architectural engineer and Senior Lecturer in the Cambridge University Department of Architecture, a fellow of Sidney Sussex College, and a founding partner of Light Earth Designs. Previously he studied architecture at the Massachusetts Institute of Technology, and worked for Conzett Bronzini Gartmann in Switzerland. His current research is focused on developing low-energy structural materials and systems in masonry, better housing in the developing world and improved engineered timber and bamboo through natural material innovation. He teaches, researches and designs buildings, and he receives research funding from the Leverhulme Trust, the Engineering and Physical Sciences Research Council, the Royal Society, the British Academy, Cambridge University and industry.





## Through an East African lens



### Research gaps

Sub-Saharan Africa is a critical hotspot of hunger and under-nutrition, and also an area whose food security is expected to be impacted seriously by future climate change. At a pivotal moment for agriculture and food security in East Africa, this meeting picked up themes from previous Forum meetings to explore questions related to the food security and future of agriculture, livelihoods and biodiversity conservation in the region. This meeting was jointly hosted with the Global Food Security Initiative and the Cambridge-Africa Programme.

**Liz Watson** argued that the rush to provide new sustainability solutions often ignores the complex realities and needs of those on the ground as well as their values, capabilities and adaptability. As a result, technological ‘fixes’ are often mal-adapted to the socioeconomic and cultural context, and the theory on paper looks very different to what actually takes place on the ground. For example, some argue that we need to increase crop yields in Africa through new technologies and investment in infrastructure. However, increasing resilience, reducing risk and providing a stable, if lower, crop yield may be more important to local farmers and it is these characteristics that can often be found in indigenous farming methods and crops. Moreover, the expected outcomes of a system redesign can fall short of expectations and can have unexpected and unintended negative consequences. She ended by saying that indigenous communities are a valuable resource for food security and future research should both strengthen and support them.

**Tinashe Chiurugwi** agreed and argued that there is a critical gap in understanding how to communicate solutions using existing institutions and communication systems. His work focuses on applying the National Institute of Agricultural Botany’s (NIAB) expertise and knowledge to an East African context and one of his greatest challenges is to provide mechanisms for farmers to access the information they need, including information about new seed varieties, which varieties best suit the conditions on their land and sowing rates when using seed saved from the previous season. He argued that information services need to be developed to connect researchers with farmers and that this discussion needs to also involve actors further down the food value chain.

**Alison Mollon** argued that one of the main priorities for future research is to explore the potential for landscape planning approaches to resolve tensions between food and energy production and biodiversity conservation. This led her to ask what are the most appropriate scales at which such planning should be undertaken. One key area within this is the food versus fuel issue, and in particular how to reduce the demand for charcoal: doing so would take an enormous pressure off biodiversity. Another is to develop greater understanding of how the changing physical interface and proximity between protected parks and inhabited areas affects the spread of zoonotic diseases and threats to human health.

## Wicked problems and questions generated by the open discussion

**There are often disconnects between discourses around competing demands for land and potential solutions:** why are they so persistent, and what is the best way to build bridges between them?

**Narratives, success stories and storylines can be as powerful as evidence** and are important in raising people's awareness of the value of natural resources. Focusing on genuine success stories in discussion and evaluation of progress was agreed to be an important part of catalysing change.

**It is easy to hold conflicting ideas about the situations we are trying to intervene in without thinking about the bigger picture.** In agricultural development we are aware of the need for increasing productivity of existing systems while reducing the environmental impact and preserving the system's future capacity. In reality, however, we do not always stop to think about what this means in practice and the effect it has on the people who live in those production landscapes. There is therefore a danger that sustainable intensification becomes a roof under which different disjointed (and sometimes contradictory) projects or activities are housed without much conversation between them: how can these be connected together?

## Witness profiles

### Dr Liz Watson

Senior Lecturer and Pybus Fellow of Newnham College, Department of Geography, University of Cambridge

Liz Watson's research focuses on the relations between livelihoods, institutions, environment and development in the drylands of the Horn of Africa. In Ethiopia, work in Konso examined the production and sustainability of its intensive agricultural terraced landscape, and focused on the nature and significance of indigenous social institutions for governing land and labour. More recently, research with the pastoralist Boran and Gabra of northern Kenya and southern Ethiopia has explored the dynamic and adaptive nature of mobile livelihoods. In the context of multiple stresses, social, cultural and political developments - as well as 'Development' projects - have often undermined indigenous institutions and have exacerbated exposure to risk and vulnerability.



### Dr Tinashe Chiurugwi

Research Associate in the Business Strategy team at the National Institute for Agricultural Botany (NIAB)

Tinashe's specialities are crop improvement and technology transfer, having worked on a range of horticultural and arable crops in Zimbabwe and the UK at Pioneer Hi-Bred, Seed Co Ltd, University of Reading, Rothamsted Research and CGIAR (the Consultative Group for International Agricultural Research) Consortium. As a research associate within the NIAB International Initiative, Chiurugwi develops proposals and fundraising strategies and delivers projects to apply NIAB skills and expertise to agricultural issues in developing countries. In Tanzania, he has also been collaborating with Naliendele Agricultural Research Institute, to identify the facilities, practices and mechanisms that would improve the translation of agricultural research into farming practice in Nachingwea District, Southern Tanzania.



### Alison Mollon

Senior Programme Manager, West & Central Africa, Acting Regional Manager, Africa at Fauna and Flora International (FFI)

Alison joined FFI in 2014 after returning from the Democratic Republic of Congo where she was the Programme Manager for the Frankfurt Zoological Society. From early 2011 Alison was based in the headquarters of the Virunga National Park and was responsible for multi-donor project implementation including the GEF National Parks Network Rehabilitation Project. Alison also became experienced in developing and leading operations in conflict zones. She specialises in species population estimates and has contributed to analysis of sampling methodology of great apes in Central Africa and has advised the government of St Lucia on best practice management and monitoring of the St Lucia Parrot. Alison is currently leading the FFI Africa Regional Team to address threats to species and habitat conservation focusing on different protected area management systems, sustainable forest use and engagement with business.






## Photo Credits:

Cover: KARI/ESA – The Okavango River 

Full Page, p4: JAXA/ESA – The Imperial Valley in Southern California 


October, p5: NASA/Reid Wiseman (@astro\_reid) – An astronaut's view from space 


November, p7: Stock Image

December, p9: ESA/NASA – Neoguri 

January, p11: Ervins Strauhmanis – A cloud 

February, p13: Institute for Manufacturing – Cotton reels

March, p15: Kalyan Varma – Turtle conservation 

April, p17: Invisiblepower – Pine forest in winter 

May, p19: ESA, CC BY-SA 3.0 IGO – Kenya, Tanzania, Uganda 

## Forum members

**Chair: Lord Martin Rees**

**Director: Professor Paul Linden**

**Executive Secretary: Dr Rosamunde Almond**

The Forum was founded in January 2013. For this topic, members were drawn from five University Schools and 15 University departments, centres and institutes, ranging from the Mongolia and Inner Asia Studies Unit (MIASU) to the Departments of Engineering, Geography and Biochemistry to the Judge Business School and the British Antarctic Survey. People from the Cambridge Institute for Sustainability Leadership (CISL) and the Cambridge Centre for Science and Policy (CSaP) are also founding members of the group.

People have been initially invited to join the Forum for two years. Founding members who took an active role in the Forum for this topic include **Dr Helen Curry**, Peter Lipton Lecturer in the Department of the History and Philosophy of Science; **Dr Hildegard Diemberger**, Senior Associate in Research in the Mongolia and Inner Asia Studies Unit (MIASU) in the Department of Social Anthropology; **Professor Peter Guthrie** from the Centre for Sustainable Development, Department of Engineering; **Professor Susan Owens**, Professor of Environment and Policy in the Department of Geography; **Dr Miles Parker**, Associate Fellow at the Cambridge Centre for Science and Policy (CSaP); **Dr Jake Reynolds**, the Director, Sustainable Economy at CISL; **Dr Emily Shuckburgh**, Head of Open Oceans at the British Antarctic Survey; **Dr Bhaskar Vira**, Director, University of Cambridge Conservation Research Institute and Reader in the Political Economy of Environment and Development, Department of Geography; and **Professor Susan Owen**, Head of Department, Professor of Environment and Policy and Professional Fellow of Newnham College, Department of Geography.

Members who joined in the last year include **Professor Paul Dupree**, Professor of Biochemistry in the Department of Biochemistry; **Professor Chris Gilligan**, Professor of Mathematical Biology, Department of Plant Sciences; **Professor Howard Griffiths**, Professor of Plant Ecology in the Department of Plant Sciences; **Professor Ian Hodge**, Professor of Rural Economy in the Department of Land Economy; and **Professor Alison Smith**, Professor of Plant Biochemistry in the Department of Plant Sciences.

## Guests

Each month, experts who work in the areas we are discussing join our meetings as guests. For this topic, people from within the University included **Dr David Coomes**, Head of the Forest Ecology and Conservation group, Department of Plant Sciences; **Dr Dennis Konadu**, Research Associate, Low Carbon and Materials Processing Group, Department of Engineering; **Dr Elena Kazamia**, Post Doctoral Research Associate, Department of Plant Sciences; **Dr Beatrix Schlarb-Ridley**, Director of Innovation and Impact, British Antarctic Survey; **Dr Pauline Essah**, The Cambridge-Africa Programme Manager; and **Dr Will Simonson**, Coordinator of the University of Cambridge Strategic Initiative in Global Food Security, Department of Plant Sciences.

Early career researchers also came to the meetings and helped to write up the notes and summaries of each one. They included **Dimitra Dantsiou**, a PhD student in the Department of Architecture; **Grant Kopec**, a PhD Student and Project Manager of the Foreseer Project, Department of Engineering; **Kristen MacAskill**, a PhD student in the Centre for Sustainable, Department of Engineering; **Rodah Owako Okeyo**, an Mphil student on the Masters in Conservation Leadership course, Department of Geography; and **Therese Rudebeck**; a PhD student in the Department of Geography.

Guests also joined us from across and outside Cambridge, including **Emily Brocklebank**, Events & Projects Coordinator, The Humanitarian Centre; **Richard Brooke**, Planning and Environment Manager, Forestry Commission England; **Phil Franks**, Senior Research, Biodiversity, International Institute for Environment and Development (IIED); and **Roger Mitchell**, a convenor of the Greater Cambridgeshire Local Nature Partnership (now called 'Natural Cambridgeshire') and Chair of the Cambridge Conservation Forum (CCF).



## Cambridge Forum for Sustainability and the Environment

For more details about the Forum and these meetings please contact Dr Rosamunde Almond ([r.almond@damtp.cam.ac.uk](mailto:r.almond@damtp.cam.ac.uk)).

Centre for Mathematical Sciences,  
Wilberforce Road, Cambridge, CB3 0WA