



### Aims

The aim of our topic this year is 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. In October, we started to think about connections between biodiversity, energy and food security and this month, the three witnesses will help us to think about some of the pressures on natural resources from the demand side, including economics, politics and health.

### Witnesses

This month, the three witnesses are:



**Bojana Bajželj**

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



**Professor Ian Bateman**

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



**Professor Theresa Marteau**

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

### Questions

This month, the witnesses have all been asked two core questions:

- 1) What do you perceive as being the main gaps in our knowledge?
- 2) What would you include in the 'next generation' of research questions?

Each of these questions will be posed to everyone and their answers will then be used as a springboard for further discussion. The main points raised will then sent to everyone to use as a starting point for the next meeting.

### Key themes from the introductions

#### Bojana Bajželj

**Background paper:** Bojana's paper was published in September this year in *Nature Climate Change* and using the BP FORSEER model, the authors suggest that healthier diets and reducing food waste are part of a combination of solutions needed to ensure food security and avoid dangerous climate change.

#### Her introduction at the beginning of the meeting:

As a part of the wider *FORSEER* project, Bojana works on developing a model that maps out the connections between land, water and energy. By making certain assumptions regarding e.g. population growth, yield trajectory and the future food supply and demand, Bojana has been able to map out and calculate land use scenarios for 2050. The result is rather pessimistic as it indicates that future demand is substantially higher than future supply. As an expansion of agricultural land is undesirable due to further biodiversity loss and increased emissions, it is necessary to find an alternative. Future research should thus focus on the following areas:

- Q1 Valuation of ecosystem services. At the moment, we are not rewarding other uses of land in the same way as land used for agriculture, how should we address this?
- Q2 How can we reduce agricultural waste? And what strategies are appropriate for various parts of the world where the waste might occur at different stages of the production-consumption chain?
- Q3 Can sustainable intensification close the yield gap? Which practices are most effective?
- Q4 How will the land use scenarios change under the uncertainty of climate change? With increased groundwater depletion? With improved technology?

#### Ian Bateman

**Background paper:** Ian's paper was published in *Science* last year as part of the work underlying the UK National Ecosystem Assessment - also known as the UK NEA - and it shows the significance of land-use change not only for agricultural production but also for emissions and sequestration of greenhouse gases, open-access recreational visits, urban green space, and wild-species diversity. The NEA is continuing its work in a series of follow-on projects.

#### His introduction at the beginning of the meeting:

He assumed that the objective of the topic is to ensure non-declining wellbeing over time

- This seems negative, he argued that as people's long term welfare depends on natural systems, focusing on human wellbeing means that natural systems have to be safeguarded

Rather than talking about his paper, he focused on three areas:

#### 1) The demand and supply of food

- We have estimates about how some parameters might change and we know, for example, that population increase will have a huge impact.
- One complication which often isn't taken into account is how people's affluence will change their behaviour and in turn, how that will change diets and land use
- While accepting that research is needed into the supply side – the role of land management, GM, agritech and precision agriculture – more research is needed into the demand side and the role that spatial and temporal variation in economic drivers and their impacts will play

#### 2) The impacts of the choices we make on the environment

- There are many fundamental natural science questions about impacts still to be answered
- Many of these impacts are interrelated and non-linear – climate change, ecology
- A lot of research concentrates on adaptation but not enough on the dynamics of adaptation and the secondary effects those will have. For example, how people will respond to the changes in climate and how those will change land use and water availability

- 3) Trying to make better decisions based on what we know about demand, supply & impacts**
- Develop truly integrated models which combine natural sciences, economics and policy and include both temporal and spatial dimensions of changes in natural capital
  - Model multiple impacts of change and how we use land
  - None of these models will ever be perfect but at the moment, different facets of this area are still very much in silos
  - Economics has an important part to play, both in how we build 'value' into models (as opposed to price - the amount of money we pay) and how we use them to make decisions
  - Ask what are the impacts of alternative land use strategies and how can we use land in a more intelligent way?

### Theresa Marteau

**Background paper:** Many diseases are associated with behaviour (overeating, smoking, alcohol and inactivity). Although recognised as harmful, these behaviours continue. Interventions often based around information and reflection on behaviours, which is often ineffectual. Human behaviour is often automatic, cued by environmental stimuli, and largely unaccompanied by conscious reflection. Interventions targeting these automatic bases may be more effective. We discuss specific interventions that target automatic processes, such as altering environments to constrain behaviour (ease of effort; availability of options; product design) or targeting associative behaviours (activating, inhibiting, altering, creating associations).

#### Her introduction at the beginning of the meeting:

She talked about behaviour change around consumption, through a lens of reducing pressure on natural resources.

Behaviour is driven largely by immediate gratification and our environment (true both of individuals and of policy makers). Your environmental impact (a direct consequence of your behaviour) is driven less by your values than by your personal affluence.

There are, broadly, two options for changing behaviour:

- Providing information to change peoples' minds** (e.g. poster campaigns):
  - This has driven public health policy for last 60 years.
  - Generally not that effective (although some evidence that providing information can change attitudes, which can then make people more susceptible to other influences).
- Changing the environment** to make something less easy or more immediately rewarding

She gave examples of reducing food waste and changing meat consumption:

#### Reducing food waste (could find no academic review of interventions):

- Change environment and associations
  - Decrease portion size, change packaging and alternative pricing (sell less for less money)
- Provide information
  - Labelling (e.g. Love Food Hate Waste)
- **Meat consumption** (note parallels with alcohol and tobacco):
  - Change environment and associations
    - Decrease availability (e.g. why do we subsidise its farming)
    - Modify associations (e.g. McDonalds in hospitals has been shown to influence perceptions of how unhealthy it is)
    - Increase price
  - Provide information
    - E.g. health or environmental campaigns on damage caused by beef industry

BUT. Although interventions have potential to modify behaviour, these options are constrained by the political and economic space that is available (e.g. how to ask companies to sell less).