Briefing for Chris Huhne MP: Follow-up to UCL dinner on 18th November

UCL was delighted to host the Secretary of State at a working dinner on 18th November. UCL's new public policy strategy aims to improve our interaction with policy-makers and ensure that our research and expertise is informing policy wherever possible. We would be pleased to engage in further discussions with DECC, including with the Chief Scientific Adviser as suggested.

This document represents a series of 1-page summaries of some of the key ideas discussed at the dinner, which were in response to various issues relating to climate change that had been identified by DECC. There was also some discussion of how universities could work more closely with government and contribute their expertise to help to develop policy.

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POPULATION, FOOD PRICES, SPECULATION AND CLIMATE CHANGE

Professor Anthony Costello, Professor of International Child Health, UCL Institute for Global Health
a.costello@ich.ucl.ac.uk

Evidence for effects of climate/environment on food security

- Meat consumption will grow by 55m to 310 million tonnes per year over the next decade, with a concomitant increase in animal feed grain by 50 to about 640 million tonnes
- Grain for biofuel increased fourfold over the past decade
- Amount of arable land worldwide divided by the total population has halved over the past 40 years, to 0.2 hectares per person.
- 1.2 billion people (20% of the world's population) live in areas of water scarcity. FAO estimated 1.02 billion people undernourished in 2009.
- USA corn and soyabean yields fell 17% for every degree rise in growing season (Lobell and Asner, 2003).
- Crop models and climate projections for 2030 from 20 models showed South Asia and Southern Africa will suffer negative impacts on maize, wheat and rice in large food-insecure human populations (Lobell et al, 2008). Half of the world's population could face severe food shortages by the end of the century (Battisti and Naylor, 2009)
- Rice production peaked in 2002. Rice feeds 70% world's poor. Robert Zeigler, Director, International Rice Research Institute, says world will face a shortage of rice unless production increases and trade barriers erected in the wake of the 2007/2008 food crisis are lowered. (Financial Times, November 2010)

Evidence that food price inflation is more important than crop availability

- World food production = 2,800 calories per capita (33% more than is needed to adequately feed the entire population). Amartya Sen: "*Starvation is the characteristic of some people not having enough food to eat. It is not the characteristic of there not being enough food to eat*"
- In Nov 2010, FAO price index (basket of wheat, corn, rice, oilseeds, dairy products, sugar and meats) highest for 2 years. Fastest rise in wheat prices for 40 years since June 2010 because of Russian drought and crop failure. Food riots in Mozambique. Bans on exports (Russia, Ukraine, India, Pakistan, Egypt, Kazakhstan)
- 2010 barley and corn crop in USA lowest for 15 years. Cotton $1.57 lb highest for 140 years, 70% up from 2m ago. Sugar prices > 33 cents lb, highest for 30 years (Nov. 2010)
- India produces 20% more calories than it needs and is a net food exporter, yet it has some of the world's worst hunger and nutrition indicators (43% of its children are underweight compared to the Sub-Saharan Africa average of 26%)
- Professor Utsa Patnaik, Monthly Review 2009: "the average Indian family of five in 2005 was consuming a staggering 110 kg less grain per year compared to 1991…. a sharp rise in intake for the wealthy minority, outweighed by a large decline for the majority. "Not only has calorie intake per capita fallen, there is also a steep decline in protein intake for four-fifths of the rural population over the period 1993–94 to 2004–05 according to the National Sample Survey Reports on Nutritional Intake (NSS)"

Food insecurity caused by speculation?

- "*(There is) a common misconception that futures prices cannot affect spot prices because speculators do not 'hoard" in the traditional sense. The reality is, however that spot prices of many consumable commodities, including oil and corn, are set by long-term contracts that are based on futures prices, allowing the tail to wag the dog. There is strong evidence that speculation exacerbated the last oil and food bubble. Speculation will fuel the next one too, unless meaningful speculative position limits are established"* - Sir Richard Branson, Virgin; Michael Masters, Masters Capital Management; David Frenk, Executive Director, Better Markets. Letter to Economist July 31st 2010

Policy implications

- DFID: Monitor food prices, crop yields and nutrition indicators in all active countries

Treasury: Consider limitations on food futures speculation other than by traditional agricultural hedging agencies

- DECC/DEFRA: Get crop yield data in relation to average growing temperature in the UK and projections for UK crop yields up to 2030. Use near-term food inflation projections as a way to promote to the general public the importance of climate change prevention and reducing greenhouse gas emissions.

INNOVATION AND CLIMATE AND ENERGY POLICY

Professor Paul Ekins, Professor of Energy and Environment Policy, UCL Energy Institute
p.ekins@ucl.ac.uk

With the global climate negotiations in rather a sticky position, there is an urgent need for evidence that emissions reduction not only need not be economically damaging but, under the right conditions, could be economically beneficial. This is the thinking behind trying to stimulate, and be successful in, a 'green race' to develop and deploy low-carbon and other environmentally beneficial technologies, in the process creating new industries and supply chains that can then become export earners and part of the UK's competitive advantage as other countries proceed down the same route.

There are two essential elements to a strategy to foster such a green race:

- Develop and deploy successfully a number of low-carbon technologies in the UK, such that they build economic strength
- Support developing countries in doing the same

These elements will be discussed in turn.

UK deployment

Much of the legislative and policy framework now exists in the UK for the successful roll-out of those low-carbon technologies in which the UK could build a competitive advantage. However, to deliver this will require flows of new capital into these areas that are several multiples of current flows. These new flows will need to come from sources that are not particularly interested in low-carbon developments *per se*, and will need to be attracted to them by their relatively favourable risk/return ratio compared to other investments. At present, the policies to create such a ratio (given that the market does not generate it by itself) are not in place. A particular issue seems to be construction risk (especially in respect of such technologies as offshore wind or new nuclear). The floor price of carbon will not help much with this (as this supports revenues once the plant is constructed), important though it is as a general signal about the future viability and attractiveness of low-carbon technologies. What seems to be required is some such mechanism as the Fossil Fuel Levy (on energy use) to provide capital for construction and thereby reduce the construction risk to the developer. It is contended that this would significantly reduce the cost of capital to the developers, which would ensure both that the project was built, and that the consumers paid less for it. There is also a need to ensure that adequate capital is attracted to the other major areas of required investment to reduce carbon emissions: CCS, the 'smart' grid, and the existing housing stock.

Developing country support

A number of emerging economies are already making significant investments in the low-carbon economy, most notably China and South Korea. At least part of their motivation is to develop low-carbon technology exports, both to developed and developing countries. South Korea has launched and is putting in $30m per year to a Global Green Growth Institute (GGGI), which is supporting other Asian and developing countries to develop the capability to install and produce these technologies. An option for the UK would be to add its support to GGGI, and thereby increase its profile in, and potential access to, these markets. A further possibility is for the UK to extend its Sustainable Development Dialogue support schemes (which have, for example, successfully supported resource efficiency activities in China, South Africa and Brazil run by the UK's National Industrial Symbiosis Programme), which have been funded by DEFRA. If the flows of low-carbon finance expand as envisaged by the international climate negotiations, then the opportunities for UK businesses that have developed low-carbon technologies that are appropriate to developing countries could be very great indeed.

MULTI-LEVEL GOVERNANCE RESPONSES TO CLIMATE CHANGE

Professor Maria Lee, Professor of Law, UCL Laws
Maria.lee@ucl.ac.uk

1. The Department for Communities and Local Government is replacing current national planning policy and guidance with a simpler, consolidated national planning framework. It is imperative that local authorities, especially in exercising their planning powers, are required to act in ways that contribute to national environmental objectives, including the 80% ghg reduction target. There is a spectrum of possibilities, from a low key 'have regard to' obligation at one extreme, to an approach that cascades formal responsibility for achieving this target to different sub-national levels of governance (as mentioned by Yvonne Rydin during the meeting).

2. These questions of scale also apply at the international level. In particular, if classic international treaty making falls short, we should continue to make progress at the sub-national level (for example, whilst the US nationally has demonstrated very little commitment to addressing climate change, some of the states and cities are seen as leaders). Similarly, the EU, including the exercise of its market power *outside* of treaty making fora (as discussed by Joanne Scott), will be crucial on the international stage.

3. UCL has considerable strength in the governance of emerging or contentious technologies. Climate change technologies, from the relatively mundane, such as wind turbines or even insulation (as discussed by Tadj Oreszczyn), to more esoteric geo-engineering, will raise governance challenges. These challenges vary, but include: responsibility for decision making, including the scale (local, national, international etc) at which decisions are properly taken, the degree (and scale) of public participation, the type of expertise required; similar questions in respect of ongoing control of the technology; ownership, payment, intellectual property issues; liability for negative impacts.

Governance varies from technology to technology, but in each case there is a balance between incentivising innovation and controlling negative impacts. Whilst there is sometimes a tension between incentivisation and control, these objectives are not in simple opposition: control of negative impacts by a trusted third party (usually government) *allows* risk taking. Experience suggests that delaying or neglecting broad governance issues associated with technological innovation can be counter-productive.

THE UCL CARBON GOVERNANCE PROJECT

Professor Chris Rapley CBE, Professor of Climate Science, UCL Earth Sciences
Christopher.rapley@ucl.ac.uk

Purpose of Project

- Provide new insight into carbon governance issues critical to progress in mitigating human-induced climate change
- Exploit and showcase UCL's unique mix of expertise and capability
- Convey conclusions to policymakers and practitioners and influence their actions

Approach

- Devise governance actions necessary to limit future human carbon emissions to half a trillion tons (0.5 GTC) thereby limiting climate warming to 2-4oC
- Draw on

- literature reviews on multilevel governance, innovation strategies and public perceptions and behaviours regarding climate change and low carbon technologies – especially on-shore wind
- "backcasting" study of World Business Council for Sustainable Development

Sub-projects

- Multi-Level Governance Arrangements (Lead: Prof Catherine Redgwell)
  - comparative study of energy production issues
- Innovation Policy (Lead: Prof Paul Ekins)
  - study of innovation theory focusing on the deployment of wind power in the EU, the USA and China
- Human Behaviour (Lead: Prof Jon Agar)
  - study of public attitudes and responses to low carbon initiatives with wind power as a case study
  - conceptualisation of attitudes to low carbon world and its consequences

Planned Outcomes

- Project report which will synthesise the three sub-projects and draw conclusions
- Refereed publication – possibly in Nature Climate Change
- High-profile launch event to publicise and disseminate the report
- Policy briefing(s) on main conclusions of the project
- Workshops to disseminate conclusions of report

Engagement with Government

- UCL to brief selected DECC/DEFRA officials during in the early spring next year on the draft conclusions of the project. We propose this should include discussion of how to best tune the presentation of results to their needs, if that is agreed as an appropriate way forward

INSTITUTIONAL FRAMEWORKS AS KEY TO POLICY SUCCESS

Professor Yvonne Rydin, Professor of Planning, Environment and Public Policy, Bartlett School of Planning, UCL
Y.Rydin@ucl.ac.uk

It is accepted that technological innovation is essential for tackling the low energy/low carbon agenda. However, take-up and successful adoption can be difficult to achieve. This had led to a specific emphasis on behavioural change, often promoted through marketing or awareness campaigns. But the effectiveness of such approaches, including cost-effectiveness is often in doubt. The answer to this conundrum is to focus on establishing the **institutional arrangements** that will deliver the desired energy and/or carbon reductions. Such institutional arrangements are a mix of:

- The **appropriate technology** for the situation; e.g. an effective form of on-site renewable energy generation that delivers greater energy savings than it embodies;
- **Economic frameworks** that incentivise behaviour through non-trivial savings that are highly visible and certain; e.g. the Feed-In-Tariffs are a good example;
- Patterns of **social behaviour** that are accepted, even socially rewarded within the local context; this means understanding the social milieu within which people (as households, families, corporate employees, professionals, etc) operate; peer pressure can then be effectively deployed to change behaviour; e.g. using schools and neighbourhood organisations can be effective ways of operationalising peer pressure; and
- The involvement of governmental and/or non-governmental stakeholders to deliver effective implementation through **governance arrangements**; e.g. local authorities, businesses and community groups can form partnerships as delivery vehicles for area retrofitting.

All of these features need to be in place, reinforcing each other, for successful policy implementation. The great strength of institutional arrangements is that they become accepted over time and continue to deliver on the policy goal – of energy and/or carbon reductions – as part of people's routine everyday decision-making, whether within communities or in corporate contexts. A good example is the green lease, which rewrites the relationship between landlord and tenant in commercial properties so that they are incentivised to work together for energy and carbon savings. The lease establishes a means of sharing of the savings from changed energy practices between parties and the technology of smart meters supports the search for energy/carbon savings with data. On its own, neither the lease nor the technology would be sufficient. Together they create a new set of financial incentives and bring parties together to discuss energy behaviour where no such dialogue had existed before.

1. The UCL Environment Institute could bring together multi-disciplinary teams to investigate whether the institutional arrangements for specific policy areas are working together to deliver on the policy goal.
2. The EPSRC-funded project CLUES (Combating Lock-in through Urban Energy Systems) runs from Oct 2010 for two years, looking at urban energy initiatives in a multi-disciplinary perspective and identifying the energy/carbon savings. DECC could provide a member of the Steering Group.

There is a mass of research on energy funded by the research councils; we have listed 34 projects to date in addition to CLUES. We could provide a review of their findings and insights.

EU ACTION ON CLIMATE CHANGE

Joanne Scott, Professor of European Law, UCL Laws
Joanne.scott@ucl.ac.uk

The EU has stated its ambition to lead global efforts to fight climate change to 2020 and beyond. Traditionally, it has sought to lead by example, taking on emission reduction targets and devising new policy instruments (especially emissions trading) that it hopes to export elsewhere. Despite this, and despite evidence of widespread public concern that the EU is not doing enough to address climate change, the EU failed to make its mark at the Copenhagen conference. It is reported that the final (disappointing) deal was struck in the absence of the EU and that the EU Council President learnt of it by way of a text. There are, however, signs that the EU's leadership style is beginning to change and that it is increasingly willing to use the size of its internal market in a bid to galvanise regulatory change elsewhere. Four specific examples support these claims:

1. Aviation: unilateral extension of the emission trading scheme to all airline operators landing planes in the EU. Covers all parts of the relevant journey including those parts outside of European airspace.
2. Clean Development Mechanism: No 'offsets' (Certified Emission Reductions) from new projects except from Least Developed Countries from the start of the third trading phase (2013), in the absence of a global deal or a bilateral agreement with the country in question.
3. Biofuels: Sustainability criteria to be met for domestic and imported biofuels to count towards EU/Member State renewable energy targets.
4. Energy-Intensive Sectors Exposed to a Significant Risk of Carbon Leakage: Option to include these in the European emissions trading scheme, though the conclusion of binding sectoral agreements will be taken into account.

It is therefore not simply that there is some abstract possibility of imposing border tax adjustments, but that already the EU is seeking to use its market power to alter the costs and benefits of taking or failing to take regulatory action elsewhere. This is of course controversial, including as a matter of international law. The aviation example is already subject to challenge before the courts. But in general the international trade regime is more forgiving of recourse to trade-related environmental measures than is commonly assumed. One thing that may be a matter of concern is the lack of clarity inherent in the EU measures in terms of what it is that another country has to do in order to maintain unimpeded access to the EU market. For example, the energy-intensive example speaks vaguely of measures leading to global GHG emission reductions of the magnitude required to address climate change effectively. The aviation example talks of third country measures to reduce the climate change impact of flights. More generally, if the EU is to defend this kind of 'contingent unilateralist' approach, it will have to develop a clearer narrative about what it requires by way of regulation in particular developed and developing countries and why in its view this is fair. It should also adopt a trial and error approach, monitoring the impact of these and other measures in order to gauge how best to use its market power to generate global regulatory change.

Ideas for how to encourage more interaction at the university/policy interface:

- University website listing one paragraph abstracts of papers written with direct policy relevance;
- Intensifying communication and collaboration between policy-makers and academics possibly through centrally driven initiatives such as UCL Grand Challenges;
- Recognising importance and authority of independent advice through multi-disciplinary bodies.

These should serve not only to answer questions identified by Government but to raise new and sometimes inconvenient questions. There should be room for both rapid-fire responses to Government questions but also for the considered elaboration of in-depth advice.

ACCELERATING TAKE-UP OF CLEAN TECHNOLOGIES THROUGH COMMUNITY-DRIVEN INNOVATION

Professor Stefaan J.R. Simons, Professor Chemical Engineering, UCL Centre for CO2 Technology
stefaan.simons@ucl.ac.uk

To achieve the CO2 emission reductions necessary to avert catastrophic climate change, we need to initiate the next industrial revolution: a transition from a low efficiency, high carbon energy system (based on fossil fuels) to one that is high efficiency and low carbon (based on renewable sources). At the same time, there needs to be a massive reduction in energy demand, through increases in efficiency and changing current practices and behaviours.

Many governments around the world have published "transition plans" outlining initiatives and schemes to reduce their country's emission levels and dependence on foreign oil and gas imports. These ambitious targets will rely on engaging community groups in energy efficiency measures and use of clean technologies. A recent report by the IPPR showed that people make choices on which technologies to use based on a variety of reasons, ranging from the aesthetic to cultural, traditional and other personal values. It is therefore necessary to engage communities in the design and development process, allowing for exchange of ideas and feedback at each stage of the process, so that the resultant technology is both clean (either in itself or the behaviour it promotes), and attractive to the community it is designed for.

The Open Innovation Paradigm

The paradigm that assumes that companies can and should use both internally and externally-generated ideas (and internal and external routes to market) to advance their technologies is known as 'open innovation'. Sharing ideas outside of the traditional business boundaries with a network incorporating all stakeholders can lead to both accelerated development and accelerated take-up, of technologies[1].

The open innovation concept is highly relevant to the development and deployment of clean technologies: most clean tech. companies are SMEs, which are inherently more reliant on relationships to develop their technologies and to reach the market place. There is also a clear role for universities in the innovation ecosystem, given their experience in collaborative research; impartiality and independence; connections to local communities; and provision of rapid prototyping of ideas, leading to product differentiation and improvements and commercial spin-outs.

The Internet-Energy Revolution and Empowering Communities

The Smart Grid is a concept ideally suited to open innovation, representing an emergent business eco-system, with emergent product markets (smart meters, metering systems, use/price management) dominated by venture-based start-ups. These require integration into a metering infrastructure and communication network akin to the internet which will only work if global standards can be agreed and if incumbent energy companies and public authorities act as system integrators.

The internet will allow us all to participate in the next industrial revolution, accelerating the transition to a low carbon future and allowing us to communicate globally in the sharing of ideas and in the development and deployment of technologies. Internet-based companies have recognised the power of the internet in accessing communities and individuals to generate ideas[2]. These initiatives demonstrate the willingness of ordinary people to get involved in technology development if they feel it is worthwhile and if tools are available that enable them to do so easily and enjoyably.

Electrochemical Innovation Laboratory

At UCL, we have begun to implement the concept of open innovation in clean technology research, development and deployment via a partnership between the Centre for CO_2 Technology and an external organisation, Ionic Ventures, that enables both parties to openly share ideas that can then be worked on to a point when they attract funding and are developed and, eventually, deployed to market. This is the Electrochemical Innovation Laboratory[3] which already has projects, researchers, and patent applications funded under this concept and are attracting interest from major multi-national companies and other research

[1] An example is the rapid uptake of the I-Pod, which reached a market audience of 50 million people in only 3 years, faster than the spread of the Internet.)

[2] InnoCentive.com provides a portal for businesses seeking solutions to problems to access 160,000 "solvers" (in return for prize money ($5,000 to $1M) to a selected solver, the seeker gets the IP), whilst Google ran Project 10100, under the banner "May those who help most, win", that attracted 150,000 ideas from individuals for new technologies they felt could make a real difference to users. Google is now backing 5 of these ideas, most of which are outside their traditional business area.

[3] Electrochemical systems are central to some of the most promising energy technologies and concepts, such as: distributed energy, combined heat and power and micro-generation; load balancing for power grids; low carbon manufacturing processes, fuel cells, energy storage, photovoltaic solar cells and CO2 conversion

groups, both internal and external to UCL. If proved successful, the new business model will be rolled-out to other UCL research groups working on themes such as energy systems and the Smart Grid.

CLIMATE CHANGE AND PLANNING

Professor Mark Tewdwr-Jones, Professor of Spatial Planning and Governance, UCL Bartlett School of Planning
m.tewdwr-jones@ucl.ac.uk

There is presently a mismatch or gap between scientific evidence base and climate change implications and planning decision making locally. Even under the proposals contained in the forthcoming localism bill, there will be a need for individuals to make informed choices not only on the merits of a development proposal, but also what is being lost or gained environmentally. Otherwise, there is a danger that local decisions will be made on perceived views rather than factual information. CLG is currently undertaking some background work on the need for mediation and advocacy in the new local planning regime, but clearly there are questions relating to: who will advise the decision makers; how wider sustainability and climate change issues and international and national obligations will be addressed by local incremental decision making; and what climate change issues could be translated into incentives measures as part of the revised planning process.

Some ideas:

1. DECC, DEFRA and CLG in partnership should either monitor the broader climate change and sustainability implications of localised decision making to ensure international obligations and national policies are being met. This could take the form of data and maps and trend analysis formulated from local authority annual submissions. This would meet the concerns of Mr Justices Sales in the recent Cala Homes v. Sec State judgement on the abolition of Regional Spatial Strategies and the potential loss of strategic environmental evidence. There would be no political role here, thus avoiding any ideological clash with the spirit of localism.

2. Establish a nationally focused ‘land use research intelligence unit’ that liaises across all government departments to monitor policy changes and the implications for long term land take. This unit could be housed within government or established in a selected university in partnership with the research councils for a fixed time period.

Promote knowledge sharing and communication in communities through the establishment of ‘sustainability centres’ that promote good practice on the use of the land, the promotion of environmental good practice, energy saving measures, and allows open discussion on land use changes and pressures. The London Design Centre in Store Street currently houses a similar theme with a large model of London, highlighting development changes, proposed and actual, and exhibitions on current topics, such as the Olympic park, strategic views, high rise, and open space, and a meeting area to allow discussions. Urbis in Manchester performs a similar role, as do exhibition centres in the Far East (Chongqing Urban Planning Museum, Hong Kong Architecture and Planning Exhibition etc). These tend to focus on the built form: my idea would be to establish centres that looked at environmental and energy issues locally. They could be housed within towns, staffed by the community volunteers or by informed neutral experts (the CLG funded Planning Aid initiative could assist here) but part funded from government and the private sector.