Tyndall Centre for Climate Change Research

The Radical Emission Reduction Conference: Abstracts

10th – 11th December 2013

Royal Society
6-9 Carlton House Terrace
London SW1Y 5AG

Table of contents

About the conference

Today, in 2013, we face an unavoidably radical future. We either continue with rising emissions and reap the radical repercussions of severe climate change, or we acknowledge that we have a choice and pursue radical emission reductions: No longer is there a non-radical option. Moreover, low-carbon supply technologies cannot deliver the necessary rate of emission reductions – they need to be complemented with rapid, deep and early reductions in energy consumption – the rationale for this conference.

While there is a wealth of research and experience in delivering incremental reductions in demand, there is little cogent analysis of non-marginal, step-change and systemic reductions – either from a research or from a practitioner perspective. This conference is intended to catalyse such a critical transition in the climate change agenda and provide an evidence-base for developing radical-mitigation strategies.

More specifically the conference will consider how to deliver reductions in energy consumption of at least 8% per year (~60% across a decade). It will foster an up-beat and can-do mentality. Obstacles, barriers and hurdles need to be considered, as do practical attempts that have failed to deliver. But lessons need to be learned; translating failure into programmes of successful mitigation is paramount not just to the framing of this event, but more importantly in tackling the very real challenges of climate change.

Abstracts: conference paper presentations (in alphabetical order)

Charlie Baker, URBED

Presentation title: 'Setting the pace of change in the world through change in the home'

Conference session title: Delivering radical mitigation 1

Biography:

Charlie trained as an architect, spent 20 years in Hulme where he was a founder member of the Homes and Work for Change Co-operatives parts of which he designed. He co-authored the Hulme Guide to Development and the Community Gateway Model for council housing transfer. He set up a sustainable design and fabrication co-op employing local people working on projects ranging from furniture to though housing to neighbourhood design, work he has continued for the last 16 years with URBED. He has worked on commercial and public sector masterplans all over the country as well community controlled intermediate housing market models. He is currently devoting most of his time to low carbon retrofit, finishing off a pilot to take a Victorian semi as close to carbon neutrality as feasible. With Nick Dodd he has devised retrofit standards, and their management, supply chain and mutual finance models for the Midlands' Sustainable Housing Action Partnership. It looks like he currently holds the national record for the lowest cost of a retrofit delivering 80% emissions reductions after doing 2 of the 'Retrofit for the Future' projects taking 10 Council semis to 80% of their previous emissions (and hopefully bills) for less than half the price of the prevailing practice. He has just finished working on Greater Manchester's Domestic Retrofit Strategy to deliver 55% CO_2 reduction by 2022 on 1.2 million homes.

Extended abstract:

We live in a consumer society, almost everything is decided on the basis of how it will appeal to the consumer. Even our politics is effectively decided this way. We are failing to get adequate speed of change because we are appealing to decision makers before we have got their constituencies to demand it. This is not how democracy or consumerism work. If we reverse that dynamic, history says we will see a cascade of change.

Once politicians see their electoral future this way, once goods and service providers see where their sales advantage will be, only then might we achieve the paradigm shift required to deliver our share of emissions reductions required to stabilise global climate change.

We can direct the taper out of endless growth economics into something more tenable in this new paradigm through this process of change and so underpin a long term environmentally, socially and economically sustainable change.

Our area of concentration is the home. Homes are responsible for 26% of our emissions, moving stuff and us around 24% business 43% public 5% and agriculture/forestry etc 2% .

There is a cascade to be created here. The principe of decimation suggests that if we decimate the carbon emissions from homes by retrofitting one in ten, we will normalise this level of change. It will become a cultural aspiration initially, catalysing wider expectations for those who have made the change in their homes.

1. 80-90% reductions in energy demand from homes is feasible for pioneers now

From our work in the TSB's Retrofit for the Future program and DECC's Go Early program we have proved that through radical fabric-first demand reduction we can get homes down to total primary energy demands of <120kWh/m^2A^{-1} emissions of <17kWh CO_2/m^2A^{-1} for about £39,000.

2. Energy price rises will increase the attraction of radically reducing its use

As energy prices continue to rise we will soon reach parity on both PV and Retrofit, PV prices already challenge the conventional assumption about orientation having to be due south and latitude. Energy prices will continue to rise over the coming decades, 7%/A for the last decade.

3. Supply chain improvements and increased volume reduce prices

Demand reductions this large are still a fringe industry, so volumes of materials are not optimised. Details are still being worked out, methods of application improved. Research carried out in 2011 suggest that a 50% reduction in cost may be feasible over the next 10-15 years. This will soon make the process more attractive for the less extraordinary consumers.

4. Self-learning systems and monitoring can speed up evolution of best practice

Data needs to be collected from almost every installation and collated with the methods and details used, feedback from contractors, designer and householder. Data needs to be shared to maximise reach. This will enable measures evolve at speed, successful measures then redeployed and so precious time is not wasted on less useful or simply inappropriate technologies that don't deliver the results.

5. Small power needs can not reduced by 80% so require decentralised generation, currently PV

So far we have found that almost all houses can accommodate PV, the average on our houses so far is 3.28kW. Allowing for flats, even if we assume an average of 3kW of PV this produces a generation capacity of 66tW of PV generation capacity producing about 75% of the non-heat electrical needs of a UK household.

6. PV becomes a substantial contributor to a future energy mix provided by renewables if there is also decentralised storage

Technology exists to use the batteries of electric vehicles instead of static large single purpose storage systems as the means to buffer and smooth out supply from intermittent renewable supply and domestic demand. Web connected charging points would allow for appropriate billing and repayments to make this work for individual owners of both car and PV array.

7. Retrofit on this scale requires financial delivery to be radically overhauled

This project could cost nearly £500billion. Cost of finance needs to be radically reduced, availability radically increased. This can be done by shortening or closing finance loops, short enough so that savers can simply see returns of 3.5-4% on their savings instead of 1-1.5%. Short or closed loop financing allows people to see the work their pension funds are doing in their communities, not in the tar sands of Alberta, further encouraging participation.

This would also demonstrate a model of economic activity predicated on low or even zero growth, a target if we are to reframe capitalism for a viable future.

8. Trusted, transparent, accountable community organisations are need to act as intermediary aggregators

We have helped set up Carbon Co-op as just such an organisation. It has so far delivered more pay-as-you-save loans than any of the country's Green Deal providers, supporting households through the process of change and putting them in charge of it.

9. Retrofitting homes this way will turn ordinary consumers homes into enlightened ones

This will precipitate a demand for other change in how their key services are delivered, leading to a consumer-led demand for change. Businesses that only deliver lip-service instead of actual change will see their market share reduce. This will create an economic imperative to change more familiar to the current economic models while further change is more gradually assimilated. Participation in renewable generation will ensure that objections to its greater roll out will be better calibrated relative to other less crucial concerns.

10. We would be able to demonstrate global leadership from one of the world's top 10 economies

While politically we are nowhere near as powerful we'd love to think we were, more of the world is influenced by our consumer demand and attendant culture. As we achieve a cultural shift here in the UK we have a better chance than many nations of this having influence more widely.

Professor Terry Barker, UEA and University of Cambridge

Presentation title: 'Demand-side regulation in the policy mix to achieve radical CO_2 reductions: modelling global decarbonisation with E3MG'

Authors: Terry Barker and Annela Anger-Kraavi

Conference session title: Pathways for radical mitigation

Biography:

TERRY BARKER is Honorary Professor, School of Environmental Sciences, UEA (from August 2013), Chairman of Cambridge Econometrics and Senior Department Fellow, 4CMR, Department of Land Economy, University of Cambridge. He is an economist with over 140 papers and books published mainly on economic modelling, energy economics, climate change mitigation policies and international trade. He was a Co-ordinating Lead Author for the IPCC's Third and Fourth Assessment Reports 2001 and 2007, taking responsibility for chapters on cross-sectoral greenhouse gas mitigation. His research interests are in "New Economics" and in developing and using large-scale models designed to address the issue of global decarbonisation at the UK, European and global scales. See http://www.landecon.cam.ac.uk/staff/profiles/tbarker.html

ANNELA ANGER-KRAAVI is a Lecturer in Macroeconomics at the University of East Anglia, UK. Her research interests include applied macroeconomics and modelling climate change policy impacts; climate change mitigation policies for international aviation and shipping; co-benefits of climate change mitigation policies such as impacts on atmospheric pollution. She teaches Environmental Economics and has worked on projects on climate change policies commissioned by the UN and UK Government. She holds BSc and MA in Biology, BSc in Economics, MPhil in Environmental Policy and a PhD in aviation and emissions trading from the University of Cambridge. Prior joining the University of East Anglia in 2013 she was a Senior Research Associate at the University of Cambridge.

Extended abstract:

Radical reductions in CO_2 emissions from reductions in consumption of fossil fuels across the economy could be modelled as coming from changes in life-styles, regulations or prices or a mix of all three. The main demand-side sources arise from the use of fossil fuels in buildings, transport and industry, and indirectly, via the use of electricity generated from fossil fuels. We assume that the power sector becomes decarbonised via a mix of emission trading schemes and regulations. We then consider the implications of a rapid reduction in demand-side fossil-fuel use coming from higher energy prices and regulation of equipment standards and energy efficiency.

We have defined “radical reductions in emissions” as a reduction of 8%pa or more over the decade 2020-2030 in the CO_2 emissions from Annex 1 countries. This target is achieved in an exercise that adapts an existing model and a set of scenarios varying critical policy assumptions, leaving other exogenous variables, except for world oil prices, unchanged. The method is to strengthen the policy mix that has been adopted or proposed by governments according to the International Energy Agency (IEA) for climate change mitigation listed in the World Energy Outlooks (WEO) of 2010, 2011 and 2012. These policies have been incorporated into the Energy-Environment-Economy Model at the Global level (E3MG) developed by the Tyndall Centre and Cambridge Econometrics over the past 14 years.

This 8%pa target reduction in CO_2 emissions over the decade 2020-2030 for Annex 1 countries is extremely demanding. For example, a reference scenario based on some shift to low-carbon technologies (e.g. renewables in power and heat generation and electric vehicles) and ongoing improvements in energy efficiency, gives a 1%pa increase in the emissions over the period. And a decarbonisation scenario, achieving a reduction by 2050 that appears to be sufficient to have a more-than-evens chance of achieving the internationally agreed 2°C target, gives a 5%pa reduction over the period.

The model E3MG is a simulation econometric model, solving year by year and estimated on annual data on the global economy and energy system over the period 1970-2006. The model is disaggregated, e.g. our version has 20 political world regions with 41 industrial sectors and 19 fuel users disaggregated for each of the regions. The detail is necessary to represent the institutional theory underlying the model. Each region is assumed to have a unique mix of tax and expenditure structures, evolving from its history and openness to trade. Each industry has its unique characteristics in terms of its history, technology, available information, and responses to exogenous shocks. The model has been built to represent in detail several policies for GHG mitigation, especially those affecting the energy system. The model has Post Keynesian properties, in contrast to the great majority of models in the literature on assessment of GHG mitigation policy. It is demand-led and supply constrained; full-employment equilibrium is not assumed; the industrial degrees of competition and returns to scale are estimated from the time-series data; and the model is open as regards economic policy, i.e. various financial deficits can persist over time.

The main special policy assumptions to achieve the radical reduction target are as follows. Emission Trading Schemes for the power sector and energy-intensive industries are introduced for most Annex 1 countries at low rates from 2015, escalating after 2020. China, Mexico and Brazil also introduce ETS schemes from 2020, but at much lower rates. By 2030 the ETS allowance price is about \$150/tCO_2 in the USA, with a world average of some \$17/tCO_2. Regulations are imposed on power generation from 2020 so that coal-fired power is gradually phased out over the decade. Regulations for buildings, equipment and vehicles are also imposed, with effects on energy saving, and the required investment are estimated from IEA scenarios as published in WEO 2010. These regulations are based on actual policies introduced or proposed by governments to reduce GHG emissions. The effects on industrial prices of the regulations are then estimated. These effects are then strengthened from 2020 onwards, with the energy saving, the associated investment and increase in prices all rising by some 17%pa. By 2030 the strength of the regulations is about 5 times that assumed by the IEA. The scale of this increase gives an indication of just how strong regulations have to become. The effects are treated as exogenous.

The main findings are as follows.

- ETS allowance prices approaching \$150/tCO_2 effectively decarbonise the power sector for Annex 1 countries and provide sufficient increase in energy prices to prevent rebound from the efficiency policies. Overall, a range of low-carbon energy sources are adopted, including gas, CCS coal and gas, nuclear, hydro, wind and solar.
- Reductions in CO_2 emissions from the ETS power sectors are much larger than those from buildings, vehicles and industry. Electricity demand continues to rise as it substitutes for fossil fuel (heat pumps, electric vehicles). Electricity prices are much higher than the reference scenario prices in 2030.
- The ETS allowances are assumed to be auctioned and the revenues used to reduce employment taxes in Annex 1 countries. The effect is to reduce unit labour costs and hence prices of labour-intensive industries compared to the reference scenario without the ETS. The reduction in oil use also reduces the world oil price.
- The Increase in investment, including indirect effects, is about 4% above the reference scenario by 2030. Combined with the effects of revenue recycling and the lower growth in world oil prices, it generates more output and employment, raising both growth rates by some 0.2 percentage points each year over the decade.

Some of the many qualifications to these findings can be listed. The IEA policies and exogenous effects are strengthened together in proportion. There are many uncertainties in the estimates and projections. The small increase in the growth rate is accommodated without increasing inflation or reducing other investments, except those for the fossil-fuel alternatives.

Professor John Barrett, University of Leeds

Presentation title: ‘The UK emergency carbon plan’

Authors: Barrett J, Roelich K, Forster P, Scott K, Owen A, Julia S and Foxon T

Conference session title: Understanding the policy context

Biography:

The paper is written by a group of Ecological Economics at the Sustainability Research Institute (SRI) at the University of Leeds. The research group focuses on understanding the social and economic implications of low carbon futures.

The lead author is John Barrett who holds a Chair at SRI in Ecological Economics. His research interests include sustainable consumption and production (SCP) modelling, carbon accounting and exploring the transition to a low carbon pathway. John has been an advisor to the UK Government on the development of carbon footprint standards and continues to work with the UK Government on "Consumption-based Emissions" being responsible for providing the headline indicator for the UK. John also works closely with other government bodies such as the Committee on Climate Change currently providing advice on carbon leakage for an upcoming report. John is an accomplished public speaker having presented to Government Select Committees and regularly appearing on Radio 4 while the research is regularly covered in the broad sheet media. John has managed numerous research projects and a large research team for over 10 years. John is also a lead author for the International Panel on Climate Change, Working Group III.

Extended abstract:

While the latest and past IPCC reports have been clear on the scale of the challenge to achieve a reasonable probability of limiting temperature rise to 2 degrees, this urgency has not been translated into equitable carbon budgets for countries let alone the generation of a coherent climate change mitigation plan. Pledges submitted by many countries under the Copenhagen Accord offer promises of emission reductions that are dependent on global participation and with no apparent mechanisms to hold them to account. There is still a tendency to discuss "distance to target" as opposed to define cumulative budgets even though the science of climate change is clear on the cumulative impact of emissions. Any realistic mention of the need for rapid change is dismissed as pessimistic, unrealistic and scaremongering.

This attitude has resulted in a narrow set of policy responses that have little connection with equitable carbon budgets for countries that lead to a reasonable probability of staying with the internationally agreed threshold of 2 degree temperature rise. The narrow focus means a dominance of technological options concentrated on the energy sector and a failure to consider the whole economy as a means of emission reduction.

This short paper takes a number of logical steps to define a carbon budget for the UK, consider the role of technology and explore how the remaining "carbon gap" can be addressed through changing both the overall level and basket of consumption. Figure 1 graphically presents these steps.

STEP 1 – Define the Global Carbon Budget between 2013 – 2050 based on IPCC 5th Assessment

STEP 2 – Distribute to countries based on per capita allocation (2013 population) and define new carbon budgets for the UK

STEP 3 – Explore contribution of changing carbon intensity towards UK's carbon budgets

STEP 4 – Define demand management limits for carbon intensive consumption and address rebound effects

STEP 5 – Explore the governance and institutions required for rapid transitions to a low carbon country

Drawing from the IPCC's 5th Assessment we assume a global carbon budget from 2013 to 2100 to be 258 Gt C. The budget is spread out over this time period on an exponential reduction curve and allocated to countries based on current population. This gives the UK 0.89% of the global carbon budget until 2100.

The following stage considers the role of technology in emission reduction. Studies of international and national emissions pathways attempt to place estimates on the level of emissions reductions that can be achieved under different scenarios. For example den Elzen et al (2007) assess the maximum rate of global emissions reductions through analysing a number of SRES scenarios, finding the maximum possible rate of global emissions reduction to be 3% per year. Taking world GDP growth into consideration this would require the carbon intensity of GDP to reduce by 6% per year. However these rates of change are historically unprecedented with the average decarbonisation rate over the 1990-2005 period for the top 25 emitting countries only around 1%.

An important element in any future CO_2 reduction strategy will be the introduction of new low carbon technologies. Kramer and Haigh (2009) analyse the historic growth in energy systems and conclude that there are physical limits to the rates at which new technologies can be deployed. For supply-side technologies, they present evidence showing that it took around 30 years for energy technologies that were available in principle to grow exponentially to reach materiality (defined as 1-2% share of the world's energy mix). After reaching materiality, the authors find that the growth of a technology then becomes linear until it captures its final market share.

Further evidence of the potential speed of carbon intensity reduction from studies that measure rebound effects question the speed of possible reduction from technological change. A comprehensive review of 500 studies suggests that direct rebounds are likely to be over 10% and could be considerably higher (i.e. 10% less savings that the projected saving from engineering principles) (Sorrell, 2009). Other reviews have shown larger ranges with Azevedo et al (2013) suggesting between 0 and 60%.

However, the Committee on Climate Change for the UK have undertaken analysis and concluded that the almost complete decarbonisation of the electricity sector by 2030 is possible, reducing from today's figure of around 400 g CO_2/KWh to 50g g CO_2/kWh by 2030. This represents around a 12% annual reduction. However, this is clearly for one sector that accounts for around 22% of the UK's consumption-based emissions. In addition, the indirect emissions have not been included in this analysis that for some technologies could be significant (Arvesen et al, 2011). With this in mind, we have developed a number of technological projections to assess the remaining carbon gap.

In conclusion, the paper identifies the need to cap the "use phase" of carbon intensive activities in order to achieve the allocated budgets. This involves reducing air miles travelled, strict caps on household and commercial energy use. The paper highlights the importance of foreclosing options to drive innovation and discusses the governance structures required to support the change.

References:

Arvesen A., Bright R., Hetwich E. (2011) Considering only first-order effects? How simplifications lead to unrealistic technology optimism in climate change mitigation, Energy Policy 39 (2011) 7448–7454.
Azevedo I., Sonnberger M., Thomas B., Morgan G., Renn O. (2013) The Rebound Effect: implications of consumer Behaviour for robust Energy Policies. International Risk Governance Council, Lausanne, 2013. ISBN 978-2-9700772-4-4.
Elzen M., Bernd Brouns N., Winkler H., Ott H. (2007) Differentation of countries' future commitments in a post-2012 climate regime: An assessment of the "South-North Dialogus Proposal, Environmental Science & Policy, Volume 10, Issue 3, May 2007, Pages 185-203
IPCC 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). Cambridge University Press, www.climatechange1013.org
Sorrell S. (2009) An Assessment of the evidence for economy-wide energy savings from improved energy efficiency, UK Energy Research Centre.

Mike Berners-Lee, Lancaster University

Presentation title: 'Psychology of human acceptance and engagement'

Conference session title: Behaviours and engaging publics

Biography:

With Duncan Clark, Mike is the author of *The Burning Question*, which looks at the underlying global dynamics of climate change and asks what mix of politics, economics, psychology and technology are required to deal with the problem. Mike Berners-Lee is the founding director of Small World Consulting which enables organisational responses to climate change. Small World maps the carbon in the supply chains of organisations of almost every size and type including BT, Taylor Wimpey, Booths supermarkets, Greater Manchester, and several local authorities. It helps organisations with the development of macro understandings, the practicalities of carbon management and the integration or sustainability into organisational fabric. Small World is an associate company of Lancaster University and its research activities include technical development of footprinting methods and models, as well as multi-disciplinary work into the enablers of sustainable behaviours. Prior to taking on the climate change agenda, Mike's background is in organisation development and behaviour change. His first book, *How Bad Are Bananas? The Carbon Footprint Of Everything*, was a practical experiment in popular engagement. It headed the Financial Times list of best science and environment books for 2010 and was Amazon's best selling environment book for that year. Bill Bryson wrote "I can't remember the last time I read a book that was more fascinating, useful and enjoyable all at the same time."

Abstract:

The need to voluntarily write off fossil fuel reserves is now clear. The continuing exponential nature of CO_2 emissions tells us that none of the talk and action to date on climate change has produced a detectable dent in the trajectory. It also strongly suggests that since efficiency and innovation have gone hand in hand with emissions growth, they are, in themselves, more likely to be integral to the dynamics of growth than to enable mitigation. The exponentiality further suggests that a feedback mechanism needs breaking at the global system level; there is plenty of evidence that local reductions are absorbed elsewhere in the system, like a squeezed balloon.

(Especially in the absence of very widespread CCS), a global constraint on the extraction of fuel is a *'must have'*. All actions can therefore be viewed in terms of their contribution to the conditions under which the global socio- economic system might shift to one in which humans have voluntarily agreed to leave fuel in the ground. Such conditions are more than the cocktail of science, politics, technology and economics to which most climate change analysis, including the above summary, is constrained. The most critically lacking element is the psychology of human acceptance of and engagement with a problem such as climate change, characterised by its abstraction, uncertainty and inescapably global systemic nature. We need to view this as an unsolved mystery, the most ignored part of the puzzle and critical to bridging the void between rationale analysis and policy.

Dr. Brenda Boardman, Environmental Change Institute, University of Oxford

Presentation title: 'Low energy lights will keep the lights on'

Conference session title: Delivering radical mitigation 1

Biography:

Until September 2007, Brenda led the Lower Carbon Futures group at the Environmental Change Institute, University of Oxford. Brenda has, in theory, retired and is now an Emeritus Fellow of the University of Oxford. Fuel poverty has been a major focus for her and she published *Fixing Fuel Poverty – challenges and solutions* with Earthscan in early 2010. The subject of fuel poverty is growing in importance across Europe. Brenda focuses on the built environment from the perspective of the user and the building provider, rather than the utility. Within this, another area of importance is market transformation and product policy. She focused on the energy used in lights and appliances through the *DECADE* projects. Her most recent publication, *Achieving zero – delivering future-friendly buildings* was published in January and considers the policies required to get all energy, in all UK buildings to zero carbon emissions by 2050, primarily through demand reduction. The role of product policy is an important component of this study.

Abstract:

Lighting in UK buildings represents up to a third of peak electricity demand and about 18% of all electricity use. In both cases, electricity demand is dropping as a result of the impact of the more energy efficient compact fluorescent lights (CFLs) and, now, light emitting diodes (LEDs). European product policy required the phase out of the energy-inefficient incandescent bulbs – a process that was speeded-up unilaterally by the British Government. The rapid adoption of LEDs would continue the reductions in electricity use and the resultant carbon emissions. It would also contribute to lowering peak electricity demand and, therefore, enable the closure of fossil-fuelled power stations.

An enhanced, market transformation, approach would incorporate EU agreement on:

- LED test standards and an extension to the energy label on light bulbs from A (for all LEDs) to A+ and A++;
- the introduction of energy labels for luminaires that include an integral light source;
- enforce the requirement for all lighting products to have and energy label, including lumens/Watt, on the packaging;

- new minimum standards, involving the complete phasing out of incandescents and halogens – it is still possible to buy the former 4 years after the introduction of banning.

Unilaterally, the UK government could:

- extend the Building Regulations to incorporate only LEDs in new buildings;
- support the use of controls for occupancy and daylight and timers for lighting in non-domestic buildings;
- monitor and limit the actual electricity used in kWh/m2 as in EN BS 15193;
- educate installers regarding energy-efficient lighting, including the importance of multiple circuits and light switches.

Professor Steffen Böhm, Essex Sustainability Institute, University of Essex

Presentation title: 'Governance failure: why carbon markets will not bring about radical emissions reductions'

Authors: Steffen Böhm, Zareen Bharucha and Jules Pretty

Conference session title: Policy options for radical mitigation (via weblink)

Biography:

STEFFAN BOHM is Director of the Essex Sustainability Institute and Professor in Management and Sustainability at Essex Business School, University of Essex. He has recently focused his attention on radical transitions to low-carbon futures via his work on Ecocultures (www.ecocultures.org) and local economies. Together with Zareen Bharucha and Jules Pretty he will publish the book *Ecocultures: Blueprints for Sustainable Communities* with Earthscan/Routledge in early 2014. More information at www.steffenboehm.net and www.essex.ac.uk/ebs/staff/profile.aspx?ID=727

ZAREEN BHARUCHA is a post-doctoral fellow at the Essex Sustainability Institute. She researches issues of resilience and well-being within agrifood systems. Projects include studies on the contribution of watershed development to resilience in India, reviews on the use and preservation of ecosystem services by farming communities (notably across the African Union) and the contribution of local food systems to psychological well-being in England.

JULES PRETTY is Deputy Vice Chancellor and Professor of Environment and Society at the University of Essex. He established the Centre for Environment and Society at the University of Essex, linking research on sustainability across University departments. He researches the importance and relevance of nature for people, and explores the links between people and the land. Key projects include research on green exercise and the sustainable intensification of agriculture. Recent books include *This Luminous Coast* (Full Circle Editions 2011; winner of the East Anglian Book of the Year award 2011) and *The Earth Only Endures: Reconnecting with Nature and Our Place In It* (Earthscan, 2007). More information at: http://www.julespretty.com, http://www.essex.ac.uk/bs/staff/profile.aspx?ID=1242 and http://www.essex.ac.uk/pvc/sustainability/

Abstract:

This paper argues that radical and lasting reductions in carbon emissions can only be achieved through a redefinition of communities' relations to nature and the land. Ecocultures are resilient communities who strive to live and work in harmony with nature; their livelihoods nurture the land and ecosystem services. Established ecocultures have been under threat for centuries, challenged by rapid industrialisation and dominant models of economic growth. However, these alternative modes of living are increasingly resurgent in both Global North and South, where communities are taking practical action to maintain or build resilient and sustainable lifestyles. These communities are exemplars of the art and science of sustainable living with radically lower carbon emissions than 'mainstream' cultures. We describe their functioning and present evidence of their potential for emissions reduction.

Specifically, we describe the organising principles which diverse Ecocultures seem to share, including an 'ethic of care' for nature, a respect for community, high ecological knowledge, and a desire to maintain and improve personal and social wellbeing. We contend that these attributes contribute to resilience by maintaining high levels of the five 'capitals' (social, natural, physical, human and financial). We will draw on case examples from around the world to demonstrate:

- How Ecocultures function;
- Why their carbon emissions are radically lower;
- The threats and stresses they face in the modern world;
- What we might learn from them; and
- What they might need in order to continue to flourish.

Nicole des Bouvrie, European Graduate School

Presentation title: 'Responsibility for radical change in emission of greenhouse gases'

Authors: Nicole des Bouvrie, Sylvia Karlsson-Vinkhuyzen and Nigel Jollands

Conference session title: Behaviours and political & social norms

Biography:

NICOLE DES BOUVRIE is pursuing a PhD in philosophy at the European Graduate School, Switzerland, after graduating as Master in philosophy of political science at Radboud University Nijmegen, the Netherlands. Her PhD topic concerns the possibility and limits of fundamental (societal) change, using the work of Michel Foucault and Alain Badiou, amongst others.

SYLVIA KARLSSON-VINKHUYZEN holds a PhD (political science) from Linköping University, Sweden and was Posdoctoral Fellow at Yale. She is assistant professor with the Public Administration and Policy Group (Wageningen University) and has published on topics including multilevel governance (e.g. *International Environmental Agreements*), global energy governance (e.g. *Ecological Economics*) global sustainable development governance

(*Natural Resources Forum, MIT Press*) and the effectiveness and legitimacy of different types of international norms (*Regulation & Governance*).

NIGEL JOLLANDS, PhD, has worked on sustainable energy and environmental policy for 20 years. Since March 2011 he is Principal Policy Manager, Energy Efficiency and Climate Change, at the European Bank for Reconstruction and Development, where he works at the interface between policy and finance. Prior to this role, he spent 5 years as Head, Energy Efficiency Unit at the International Energy Agency, liaising with multi-lateral energy efficiency initiatives including the G8 and the International Partnership for Energy Efficiency Cooperation (IPEEC). Nigel's previous positions include Principal Ecological Economist in the New Zealand Centre for Ecological Economics (NZCEE), Senior Lecturer at Massey University, and senior policy analyst in New Zealand's capital at various Ministries (Ministry of Commerce; Energy Efficiency and Conservation Authority and Ministry for the Environment).

Extended abstract:

In order to achieve a radical reduction of greenhouse gas emissions, it is necessary to realise that it is not enough to modify the manner in which we act while keeping the same paradigms on how we think about humanity, the world, its climate and the way we are responsible towards this all.

When we want change, we need to distinguish between modification and radical change. A modification is a reshuffling of pawns on the chessboard that keeps almost everything comfortably unchanged. Lots of policies involving climate change are modifications of the same, occupying themselves with re-arranging of deck chairs on the Titanic. Modification is the type of change that does not address fundamental issues and allows us to continue thinking within the same frameworks. It is the type of change that Kevin Anderson described as taking place "**within** the political and economic hegemony."[1]

This in contrast to what we will try to delineate here, a 'radical' change, something related to what Anderson has referred to as "revolutionary change **to** the political and economic hegemony"[2]. When we are looking for a 'radical' (in the sense of extreme, far-reaching, all-encompassing) reduction of emissions, we are actually searching for 'radical' change. In this paper, we look at why and how radical change differs from modifications and what is necessary at the level of the structures of paradigms and underlying epistemic notions regarding human nature to achieve this radical change. We discuss what it means to desire radical change, using contemporary philosophy as a method to create an understanding of the nature and character of the problem of climate change. In doing so, we outline how radical change means more than a superficial change (a modification) but instead changes the 'episteme' (Foucault), the 'world' (Badiou) in which we find ourselves.

Applying this to the present manner in which climate change negotiations takes place, brings about several concerns when it comes to reaching radical change. One is the influence our desire to change has on the possible outcomes of the process of change that institutions and individuals are seeking to start and implement. Another is the problem of how we structure the required outcome of the process of change. Generally it is acceptable to frame scenarios of climate change in terms of cost-efficiency, percentages of emission reduction or the target atmospheric CO_2 concentration. Yet we develop the argument that predefining the outcome of any change limits the possible processes leading to this change. In fact, when we already know the necessary outcome, the change that is necessary cannot be considered radical at all.

As one of the main problems concerns the framing of the problem and the solution, we will refrain from adding one more alternative solution to the problem of climate change. Instead we will discuss one of the foundational attitudes of individuals and institutions alike that shapes the structure within we find ourselves: namely responsibility. We propose a different perspective on responsibility that can lead to creating an environment in which the event of radical change could be possible.

We argue that radical change needs a commitment that is not fear-driven, but is based upon an understanding that it is detrimental to put any limit on the manner in which deliberation takes place. Implementing an environment in which radical change can happen requires openness towards that what is considered impossible in the given episteme.

When one agrees that radical change in emission of greenhouse gasses is necessary, we need to become responsible to make this radical change happen, instead of being responsible to reach the delineated emission-rate that would solve the problem as we conceive it in the present-day understanding, such as the 2°target. It is, in the words of Derrida, the need to look for the im-possible. The outcome of a radical change is "un-predictable, an event worthy of this name… The event must announce itself as im-possible… An event or an invention are only possible as im-possible"[3].

For the radical change in greenhouse gas emissions the responsibility towards the radicalness of change means that those involved in the climate change negotiations and policy-making need to let go of their preconceived notions of climate, change, and general structure of cause and effect, science and human life.

It is as Albert Einstein already warned us some 60 years ago. "Today we must abandon competition and secure cooperation. This must be the central fact in all our considerations of international affairs; otherwise we face certain disaster. Past thinking and methods did not prevent world wars [and climate change]. Future thinking must prevent wars [and climate change]."[4]

Our proposed 'recipe' for moving toward radical change is that both individuals and institutions manifest a different understanding of the concept of responsibility and thereby committing themselves to the process of bringing about of radical change. Only when individuals and institutions themselves feel the need to respond to the call to bring about radical change, not because of a fear of punishment but due to an inner need, we can start building an environment in which radical change can come about.

We argue that one cannot desire radical change without acknowledging that we (individuals and institutions) may be swept off our feet, that we may lose influence and control. We need to accept that modifications are not going to bring about radical emission reductions. What we need is radical change, including radical change in our own backyard, our understanding of leadership and in our own epistemic notions of what change means.

References:

1 Quoting Kevin Anderson, 2013, by Naomi Klein, "How Science is Telling Us All to Revolt", *New Statesman*, 29th October 2013, http://www.newstatesman.com/2013/10/science-says-revolt.
2 Kevin Anderson as quoted by Naomi Klein, idem. Emphasis by Anderson.
3 Jacques Derrida, Voyous (Paris: Galilée, 2003), p.198.
4 Albert Einstein, "Only Then Shall We Find Courage", *New York Times Magazine* (23 June 1946).
*Disclaimer: The views expressed in this paper are made in the authors' personal capacity and do not reflect the views of their institutions.

Dr. Alice Bows-Larkin, Tyndall Manchester

Presentation title: 'Shipping visions on the horizon'

Authors: Alice Bows-Larkin, Sarah Mander, Conor Walsh, Paul Gilbert, Michael Traut and Kevin Anderson

Conference session title: Delivering radical mitigation 2

Biography:

Alice is a Reader in Energy and Climate Change as part of the Tyndall Centre for Climate Change Research and based within the School of Mechanical, Civil and Aerospace Engineering (MACE), University of Manchester. Alice trained as an astrophysicist at the University of Leeds, did her PhD in climate modelling at Imperial College, joining the interdisciplinary Tyndall Centre to research conflicts between climate change and aviation. Alice is now a Reader, active in both research and teaching, with broad research interests revolving around energy systems and the transition to a low carbon economy. In addition to a focus on emission budgets for decarbonistaion, Alice's core research at present is on international transportation, specifically shipping, leading a theme on demand-side change in a new EPSRC Energy Programme funded project 'Shipping in Changing Climates'. She also has interests at the energy, food and water nexus, leading a new network food@manchester across the University as well as a research theme on Managing Infrastructural Change within MACE. In addition to conventional academic inquiry, Alice makes an explicit connection between her academic research and the broader policy context, and as a result, her work on international transport, energy systems and carbon budgets has had a significant impact on topical debates and policy development, including shaping the UK's Climate Change Act.

Abstract:

International aviation and shipping are commonly linked by academics and policymakers because of their treatment within the Kyoto Protocol and rapidly growing CO_2 emissions. Their exclusion from national greenhouse gas commitments reduces pressure to design and implement low-carbon mitigation measures; one reason for continued CO_2 growth. Another stems from their international interconnectivity, and for shipping, the system's complexity that has led to both overcapacity and an unwillingness of multi-nation actors to invest. Cutting international transport's CO_2 is often claimed to be irresolvable without global market-based intervention and/or a global carbon cap. The debate has become paralysed by perceived barriers, compounded by existing global governance arrangements. Yet, for shipping at least, there are feasible visions of radical change on the horizon. Unbounded by weight constraints or direct passenger expectations more pertinent to aviation, there are a plethora of technologies that could be brought into the shipping system to deliver radical, and in some cases rapid cuts in CO_2. This paper draws upon the EPSRC *High Seas* project to present radical scenarios for turning high rates of CO_2 growth into high rates of CO_2 decline. Emphasis is placed on articulating positive solutions, like combining slow steaming with wind propulsion, retrofit options, and shifting patterns of demand. Then, building on stakeholder insights and expert judgement, barriers are identified and enabling mechanisms highlighted to take the debate from global stagnation towards rapid and realisable change.

Dr. Milena Buchs, University of Southampton

Presentation title: 'Can third sector organisations promote radical behaviour change? A review of Carbon Conversations'

Authors: Milena Buchs, Emma Hinton and Rosemary Randall

Conference session title: Mobilising action amongst non-government actors

Biography:

Milena Buchs is a Senior Lecturer in Sociology and Social Policy at the University of Southampton. Her main research interests relate to low carbon practices and behaviour change, as well as distributional implications of climate change mitigation policies. Funded research includes a project on third sector initiatives for low carbon practices which is part of the ESRC and Office for Civil Society funded Third Sector Research Centre, the RCUK-funded "Energy and Communities" project, the EPSRC-funded "Liveable Cities" project and the ESRC funded project "Who emits most?".

Abstract:

Low carbon societies will require radically changed lifestyles since known technologies are unlikely to deliver required emission reductions at current levels of consumption. Can radical behaviour change happen voluntarily, supported by campaigns and third sector initiatives, or will they only happen in response to broader policy changes? This presentation addresses this question by discussing findings from ESRC/Office for Civil Society funded research on Carbon Conversations, a voluntary initiative that encourages participants to substantially reduce their carbon footprints.

In contrast to many other behaviour change interventions, Carbon Conversations acknowledges the embeddedness of individuals' behaviours within social relationships and the role of social norms, discourses, policies, and technologies. It also assumes that behaviour change will be more effective and longer lasting if it is "intrinsically" motivated and if participants are given the opportunity to engage with difficult emotions around climate change and practice alteration. Our research is based on a Carbon Conversations participant survey and 94 semi-structured interviews with organisers, facilitators and participants.

Results show that participation in Carbon Conversations can involve radical carbon footprint reductions and behaviour change, such as giving up flights, adopting vegetarianism or "downsizing". At the same time, radical changes remain difficult and slow for many participants who point to dominant "mainstream" values and norms and a lack of policy and infrastructure support. This suggests that small-group behaviour change initiatives such as Carbon Conversations are impactful, this work needs to be supported by broader shifts of social values and effective policy frameworks.

Simon Bullock, Friends of the Earth

Presentation title: 'Utilising the DECC 2050 energy pathway to model radical emissions reductions, and the 'political' limitations of the model'

Authors: Simon Bullock and Mike Childs

Conference session title: Pathways for radical mitigation

Biography:

SIMON BULLOCK leads Friends of the Earth's Climate and Energy Programme. He has written numerous reports and briefings for the organisation. He has also given evidence to Parliamentary select committees on a number of occasions. He is Friends of the Earth's expert on carbon budgets.

MIKE CHILDS is Friends of the Earth's Head of Science, Policy & Research. He led Friends of the Earth's Big Ask Campaign which legally enshrined carbon budgets in the UK. He has also supported campaigns for climate change laws across Europe.

Abstract:

Friends of the Earth's 2010 report Reckless Gamblers calculated that the UK's share of a global carbon budget compatible with a likely chance (>66%) of keeping below 2 degrees temperature rise would be 9 GtCO2e between 2010 and 2049. This assumes an equal per capita distribution of the world's remaining global carbon budget.

Friends of the Earth used DECC's 2050 pathway model to assess whether this is possible, whilst also addressing other environmental concerns, for example by limiting biomass use. The lowest pathway we were able to model was one with total emissions of 12.6 GtCO2e because of the parameters of DECC's model. The model offers options between "level 1" (little action) and "level 4" ("pushes towards the physical or technical limits of what can be achieved"). In many instances, Level 4 is indeed a tough ask. However, on the demand-side, DECC take a view that cutting demand for transport, in particular, will be extremely difficult to do, presumably for political not technical or physical reasons. For example, "Level 4" for international aviation sees an 85% increase in passenger numbers.

Friends of the Earth's assessment is that, with different assumptions on what is possible across a range of the model's parameters, there are up to 4GtCO2e of additional savings possible, bringing a minimum UK carbon budget down to just under 9GtCO2e. Radical emissions cuts are possible. We argue that the model should be amended to remove 'politically inspired' limitations.

Dr. Dan Calverley, Tyndall Manchester

Presentation title: 'Choice-editing the car market: radical reductions without reinventing the wheel'

Authors: Dan Calverley and Kevin Anderson

Conference session title: Delivering radical mitigation 2

Biography:

Dan Calverley is a research associate at the Tyndall Centre for Climate Change Research at the University of Manchester, where he gained his PhD in 2012. His doctoral research on cumulative emissions reductions in the UK passenger car sector through near term interventions in technology and use took an interdisciplinary approach to investigating the potential for step changes in supply and demand. He is currently working on the RESNET project (Resilient Electricity Networks - Great Britain), looking at the impacts for the grid of uptake of new energy consuming technologies out to 2080, with particular reference to electric vehicles. Prior to joining Tyndall Manchester, Dan worked as a local authority pollution control officer for two years and IT recruitment consultant for six. He holds degrees in philosophy and environmental science.

Kevin Anderson is professor of energy and climate change in the School of Mechanical, Aerospace and Civil Engineering at the University of Manchester, and deputy director of the Tyndall Centre for Climate Change Research, with recent research publications in Royal Society journals and Nature. He engages widely across all tiers of government; from reporting on aviation-related emissions to the EU Parliament, advising the Prime Minister's office on carbon trading and contributing to the development of the UK's Climate Change Act. With his colleague, Alice Bows-Larkin, Kevin's work on carbon budgets has been pivotal in revealing the widening gulf between political rhetoric on climate change and the reality of rapidly escalating emissions. Kevin has a decade's industrial experience, principally in the petrochemical industry.

Extended abstract:

Summary

Vehicle technologies, infrastructures and fuels that are already commercially mature could deliver radical and early reductions in car emissions, without necessarily reducing vehicle-kilometres travelled or increasing the price of car travel. Stronger regulation of new car emissions, alongside a longer-term transition to alternative fuels, could yield reductions more in line with the UK's fair contribution to avoiding 2°C climate change than current policies.

The UK passenger car sector, although traditionally portrayed as difficult to decarbonise, is arguably more amenable to rapid decarbonisation than many other sectors. Perceived difficulties derive principally from public antipathy towards coercive demand reduction policies (hence reluctance of elected officials to intervene) and the ineffectiveness of voluntary demand management in delivering step changes in car use. Policies and measures have therefore favoured supply-side, technological approaches, with mitigation premised largely on improving vehicle efficiency and reducing fuel-carbon intensity. Thus, the relatively modest mitigation planned for the sector over the next decade in the UK's Low Carbon Transition Plan comes entirely from realising the EU new car emissions regulations in 2015 and 2020 and more biofuels in the road fuel mix. Beyond 2020, further

decarbonisation through increasing penetration of electricity is widely held as the key to decarbonising the passenger car sector. The crucial caveat for this strategy is that it is heavily dependent on decarbonising the electricity sector, currently in doubt given the government's rejection of an electricity carbon intensity target for 2030. In the meantime, electric vehicles (EVs) must also overcome their significant disadvantages in terms of purchase price, range, versatility and longevity compared to internal combustion-engined (ICE) vehicles.

Yet even while fossil-powered ICE-vehicles will continue to dominate the car sector for at least the next decade, radical mitigation could still be achieved through widespread adoption of the best available commercially mature and price competitive technologies. There are currently more than 30 models of ICE-vehicles available on the UK and European new car market capable of emissions-per-kilometre below the (now disputed) 2020 EU regulatory target (95gCO2/km). Evidently the once-feared engineering and cost barriers to producing practical cars with emissions around half the UK fleet average have not materialised. Nevertheless, powerful lobbying from manufacturers has resulted in weak legislation at the European level, with emissions targets predicated on vehicle mass (weight), not set at absolute levels. As such, less stringent targets apply to manufacturers whose sales comprise heavier, more powerful cars than to manufacturers selling mainly smaller, lighter cars – denying any incentive to cut absolute emissions by reducing mean vehicle mass.

This presentation highlights research into the extent of emissions cuts that could be achieved in the next decade without reliance on decarbonising electricity supply, using only commercially available vehicle technology with ongoing annual improvements in efficiency. Quantitative scenarios are created using a bottom-up fleet emissions model to illustrate the effects of more tightly regulating new vehicle fuel efficiency. Holding basic fleet characteristics constant, mean emissions per kilometre of new additions to the fleet were subject to an annual 'efficiency improvement ratchet', starting from current 'best available' ICE-vehicle technology of 90gCO2/km. The automotive engineering literature supports the potential for a 3% p.a. improvement delivered through (1) vehicle lightweighting (2) engine downsizing + turbo charging (3) retuning of powertrain performance characteristics (4) hybrid technology & regenerative braking (5) non-powertrain measures (aero/ rolling resistance / feedback mechanisms). Such an efficiency ratchet could return a 40% reduction in annual fleet aggregate emissions within a decade (from around 70 MtCO2 in 2012 to 43 MtCO2 in 2022), with the adoption of more conservative driving styles, which better reflect test cycle conditions, yielding a further 2% saving (for example through strict enforcement of speed limits).

This scenario sees average new car test cycle emissions in 2022 falling to approximately 73 gCO2/km – equivalent to real world emissions of ~79 gCO2/km, or 3 litres diesel (3.4 litres petrol) per 100 km. The ICE-vehicle technology required to achieve these values was offered over a decade ago to German car buyers in the form of the Audi A2 '3L', suggesting that there is scope for still greater mitigation by regulating maximum emissions per kilometre rather that manufacturers' mean values. It is imperative that target values are absolute, not mass-weighted, if these reductions are to be delivered in practice. Scrappage incentives may increase the rate of penetration of lower emitting vehicles into the fleet, although their emissions savings potential depends to a large extent on the presence of restraint-based measures to mitigate rebound effects that occur when swapping a more economical vehicle for a less efficient model.

Significantly, even under this 'efficiency ratchet' scenario, cumulative emissions from the passenger car sector still exceed a sectoral budget in keeping with the UK decarbonising at a rate consistent with a lower than 50% probability of exceeding 2°C. In addition to steady improvements in vehicle efficiency, a 25% reduction in total vehicle kilometres travelled by

the passenger car fleet would be also be required to constrain cumulative emissions sufficiently to respect a sectoral budget based on a 50% probability of exceeding 2°C. While a reduction in per capita driving of this magnitude is supported in principle by many drivers – crucially subject to better provision for public or unpowered alternatives – evidence suggests that such a step change in use would require the introduction of restraint based measures, such as road user charging, minimum occupancy vehicle lanes, or further reaching policies such as personal carbon allowances.

Stuart Capstick, Cardiff University

Presentation title: 'Social science prospects for radical change'

Authors: Stuart Capstick, Irene Lorenzoni, Adam Corner and Lorraine Whitmarsh

Conference session title: Behaviours and engaging publics

Biography:

I research public understanding of climate change within the interdisciplinary Understanding Risk Group at Cardiff University. I have a particular interest in examining the language used by people to interpret the physical, social, personal and ethical dimensions of climate change and how this has changed over time. My research also concerns the role of direct experience as an influence on perceptions of climate change, attitudes towards climate change adaptation, and public understanding of ocean acidification. In recent years I have carried out work looking at the psychological aspects of personal carbon allowances as a means of achieving large-scale personal emissions reduction.

Extended abstract:

Over the past two decades, practitioners across the social sciences, in policy and beyond have proposed, trialled and developed a wide range of theoretical and practical approaches designed to bring about changes in the behaviours and lifestyles that contribute to climate change. This focus at the individual and social scale has been premised on a recognition that the majority of a developed nation's carbon emissions can be traced back to everyday activities and the choices people make about energy use and other environmentally-significant behaviours. The importance of reducing personal emissions has been affirmed by the IPCC, which referred within its Fourth Assessment Report to the capacity for changes in lifestyle and behaviour patterns to contribute to cross-sectoral climate change mitigation. The 2007 Stern Review into the Economics of Climate Change similarly argued that dangerous climate change cannot be avoided without behavioural change by individuals and communities. Social psychologists, among others, have drawn attention to the potential for climate mitigation which could be unlocked through the application of insights into the affective, cognitive, value-based, and social and broader contextual determinants of people's actions.

Despite the acknowledged need to understand and influence the role of the individual in contributing to climate change, the disparity between what might be and what has been achieved has become discomfiting. With the exception of the establishment of a small number of iconic behaviours such as recycling, it has proved extremely difficult to bring about meaningful transformations in personal emissions at either the individual or societal

level. On the basis of a number of reviews, it would seem that whilst some change is achievable, there are profound limits to what can be accomplished using current, conventional approaches.

We suggest that several prevailing (though often unstated) assumptions and tendencies have determined the nature of progress to date. There has been an expectation that change be confined to small-scale and undemanding changes in behaviour (for example, switching off unused appliances); a concomitant neglect of highly impactful activities because of the perceived political infeasibility of doing so (for example, levels of consumption); a reluctance on the part of social scientists to take strong normative positions (specifically, to see themselves as advocates for change rather than disinterested theoreticians); and a lack of integration – and at times outright hostility – between different disciplinary traditions (for example between behavioural science and social practice based approaches).

We ask what a truly radical approach to reducing personal emissions would mean and look like from social science perspectives which challenge these conditions, and which explore new alternatives for change whilst applying the lessons of effective interventions carried out to date. We emphasise the many difficulties which are likely to impede the instituting of genuinely radical societal change regarding climate change mitigation, whilst proposing ways that the ground could be prepared for this to take place.

In the first instance, we suggest that a radical social science of climate change mitigation would set out deliberately to enter territory which is complex and often seemingly intractable – but where personal emissions are significant. One case in point concerns mobility: travel represents over a quarter of UK households' carbon emissions, yet is seen by individuals as being among the least popular of behavioural changes, and has received relatively low levels of attention by the social science community. In addition, changing mobility behaviours requires synergies across disciplines such that the structural, social and psychological elements of modal choice are considered in tandem. Concrete examples do exist of effective interventions in this area, particularly recent initiatives to foster cultures of cycling and enable individuals to shift to this mode of transport. Where these have been effective there has been an implicit recognition of psychological factors (for example, targeted approaches to break habits and the provision of incentives), community and organisational scale influences (for example, the introduction of telecommuting schemes in workplaces), and structural changes such as the creation of 'walkable' urban environments. Very little work has so far explored how to change flying behaviour; yet increasingly, this is likely to be even harder – and more important – to change than driving. As such, it may be seen as another aspect of mobility which a 'radical' social science should be prepared to address.

A second area, more difficult still, and which has to all intents and purposes been off-limits to mainstream social science as an area for transformation, concerns the role of general consumption and consumer culture. Whilst the functions and characteristics of consumerism have been well-articulated, particularly within sociological theory, there have been few efforts by social scientists to bring about reduced levels of consumption on the grounds of climate mitigation – despite that the majority of developed nations' emissions are embedded in products and services as part of global supply chains. We propose that a truly radical social science would seek to challenge the activities and logics of consumption using the techniques and theories developed for less controversial areas of life – and suggest that this would necessitate new sites of collaboration between disciplines.

In summary, engendering radical behavioural and lifestyle change will require a social science that is comfortable with explicitly promoting pro-environmental behavioural and lifestyle change as a normative aim; the expectation that such change will encompass much more than minor adjustments to existing practices; institutional support from research

funders (and policy makers) for these goals; and a willingness to work across disciplinary divides to address the multiple influences on lifestyles.

Laurence Delina and Dr. Mark Diesendorf, Institute of Environmental Studies, University of New South Wales

Presentation title: 'Is wartime mobilisation a suitable policy model for rapid national climate mitigation?'

Conference session title: Understanding the policy context (via weblink)

Biography:

LAURENCE L DELINA is a PhD candidate at the Institute of Environmental Studies at the University of New South Wales in Sydney, an Earth System Governance Fellow, and an Associate at the Center for Governance and Sustainability at University of Massachusetts Boston. In Spring 2013, he was a Visiting Fellow at the John F. Kennedy School of Government at Harvard University. Laurence had worked with the United Nations, the University of Manchester, the Institute of Global Environmental Strategies, and Land Bank of the Philippines. He has published on issues surrounding governance of sustainable energy, climate finance, institutions, and climate change in Asia and beyond. His current research project, with Dr Mark Diesendorf, tackles the future relationship between climate change and governance.

DR MARK DIESENDORF, A/Prof and Deputy Director, Institute of Environmental Studies, University of New South Wales, Sydney. Previous appointments include: Principal Research Scientist, Commonwealth Scientific and Industrial Research Organisation; Professor of Environmental Science and Founding Director, Institute for Sustainable Fu tures, University of Technology Sydney; Director, Sustainability Centre Pty Ltd. Over 100 peer-reviewed publications. Recent books include 'Human Ecology, Human Economy: Ideas for an ecologically sustainable future' (co-edited; Allen & Unwin); 'Greenhouse Solutions with Sustainable Energy' (UNSW Press); 'Climate Action: A campaign manual for greenhouse solutions' (UNSW Press); 'Sustainable Energy Solutions for Climate Change' (in preparation for Routledge-Earthscan).

Abstract:

Climate science suggests that, to have a high probability of limiting global warming to an average temperature increase of 2ºC, global greenhouse gas emissions must peak by 2020 and be reduced to close to zero by 2040. However, the current trend is heading towards at least 4ºC by 2100 and little effective action is being taken. This paper commences the process of developing contingency plans for a scenario in which a sudden major global climate impact galvanises governments to implement emergency climate mitigation targets and programs. Climate activists assert that rapid mitigation is feasible, invoking the scale and scope of wartime mobilisation strategies. This paper draws upon historical accounts of social, technological and economic restructurings in several countries during World War 2 in order to investigate potential applications of wartime experience to radical, rigorous and rapid climate mitigation strategies. We focus on the energy sector, the biggest single contributor to global climate change, in developed and rapidly developing countries. We find

that, while wartime experience suggests some potential strategies for rapid climate mitigation in the areas of finance and labour, it also has severe limitations, resulting from its lack of democratic processes. Furthermore, since restructuring the existing socio-economic system to mitigate climate change is more complex than fighting a war and since the threat of climate change is less obvious to non-scientists, it is unlikely that the public will be unified in support of such executive action.

Dr. Angela Druckman, University of Surrey

Presentation title: 'Low carbon fun: lifestyles in a low emissions society'

Authors: Angela Druckman and Tim Jackson

Conference session title: Lifestyles and emissions

Biography:

Angela Druckman is Senior Lecturer in Sustainable Energy & Climate Change Mitigation at the Centre for Environmental Strategy, University of Surrey. Angela's research focuses on the environmental impacts of household consumption. She has published widely and has a particular interest in exploring the linkages between lifestyles and carbon emissions in order to inform policies aimed at moving towards a low carbon society. Angela read Engineering at Cambridge University and achieved Chartered Engineer status through working in research and development in the field of electronics. She has had a wide variety of experience, including lecturing in electronics at Kingston University, commercial sector management for a thriving IT company, and non-governmental advocacy on climate change for Friends of the Earth.

Abstract:

The premise of this presentation is that technological change is not enough to achieve the radical emissions reductions required: lifestyles also need to change.

Building on previous studies in which we attempted to quantify the carbon required for a 'decent' life and the carbon associated with the time used for various activities, we propose a vision for the future. Our vision builds on 'win-win' synergies between the way we use our time, activities that make us happy, the structure of society, and infrastructure provision.

Taking the perspective of time use, we propose a locally-based society, where time is spent within the home and local community. This chimes with studies which indicate that spending time with friends and family is associated with increased well-being, and that such activities have lower emissions. Local communities, which include facilities for recreation, health, shared workspace-hubs, shopping and education, will build social capital. Families and friends who are geographically dispersed will interact through enhanced digital communications.

We use a case study of the UK to make approximate estimates of the carbon reductions achievable, but stress that the vision is highly applicable to rapidly changing emerging economies such as China: there is a window of opportunity for China's burgeoning middle class to adopt this model rather than follow the 'American Dream'.

The presentation concludes with policy implications, which include: investment in digital infrastructure and community assets in preference to transportation; radical policies minimising pay differentials; and work-time reductions. Simplistic assumptions must be treated with caution: changes in consumption will necessarily effect production and incomes. In particular it will be important to ensure safeguards are in place for less well-off groups. Nevertheless, when coupled with technological changes, our envisioned society offers a way of achieving radical emissions reductions.

Dr. Tina Fawcett, Environmental Change Institute, University of Oxford

Presentation title: 'Personal carbon trading in a radical future'

Authors: Tina Fawcett and Yael Parag

Conference session title: Policy options for radical mitigation

Biography:

DR TINA FAWCETT is a senior researcher at the Environmental Change Institute, University of Oxford. Her research focuses on energy demand and energy policy. Particular research interests include: understanding energy use and the technical, social and economic forces which influence it; personal carbon trading; low-carbon renovation in the residential sector; heat pumps; carbon emissions from higher education; energy-related decision-making in the non-domestic sectors; the ethics of carbon offsetting. Current projects include: Building Expertise, which is investigating the current and potential future roles for a range of professions as they react to the low-carbon renovation agenda, in both the UK and France; ENLITEN, which is investigating reducing carbon emissions from energy use in buildings by incentivising and influencing changes in the habitual behaviours of the buildings' occupants.

DR YAEL PARAG is a senior lecturer at the IDC's School of Sustainability, Israel. Between 2005 and 2011 she was a senior researcher at the Lower Carbon Future group in the Environmental Change Institute (ECI), University of Oxford, UK. Dr. Parag has specializing in the study of 'soft' aspects of energy demand policies. In this capacity she researched Personal Carbon Trading (PCT), a radical mitigation policy; local and community governance of energy in the UK; the security of energy services; the relations between energy consumers, energy suppliers and government and their implication on emission reduction. In her current research she is looking at agents that could mobilize change from the 'middle-out' (as oppose to 'top-down' and 'bottom-up'). She focuses on the roles that different communities and social networks play at governing energy policies and practices in the UK. Dr. Parag recently received the EU FP7 Marie Curie Career Integration Grant (CIG) to examine socio-technical approach for energy service security (€100k).

Extended abstract:

Overview

The transition to a low carbon economy and low carbon society will be complex and involve many changes. All sectors of society - producers and consumers, organisations and individuals - will have to make adjustments, not all of them welcome. Maintaining support for the low carbon transition will critically depend on the fairness (and perceived fairness) of the

mechanisms and policies in place. This will become more important as reduction goals increase. Therefore, as well as being effective and efficient, transition policies must deliver a sufficiently fair transformation.

Personal carbon trading (PCT) is a radical and innovative mitigation policy which offers an equitable means of reducing emissions from household energy use and personal travel. PCT offers two dimensions of fairness – firstly, everyone gets an equal carbon allowance, a 'fair share'. Secondly, modelling of the impacts of a PCT scheme shows it would be progressive and would disadvantage fewer low-income people than an alternative policy of carbon taxation. Given the risk posed by dangerous climate change on the one hand, and local and international political paralysis on the other hand, PCT could offer both an effective and an acceptably fair way of managing rapid carbon reductions.

Expanded description of Personal Carbon Trading

PCT is a general term used to describe a variety of downstream cap-and-trade policies, which locate rights and responsibilities for the carbon emissions from household energy use and/or personal travel at the individual level. A PCT policy including household energy use and personal travel (excluding international aviation) would cover an average of 45% of national emissions of CO_2 from energy use in major developed countries. PCT is markedly different from current policies covering individual energy use and carbon emissions, which often operate at a distance from individuals (e.g. obligations on energy suppliers), do not require their direct involvement (e.g. minimum efficiency standards for products), and fail to communicate the significance of different decisions on personal carbon emissions. PCT is not envisaged as replacing most current policy, but rather as an enabling policy which encourages individuals to make the most of existing schemes such as product and building standards, energy labels, and taxation and financial incentives.

A number of different PCT schemes have been explored. They vary in their inclusiveness, the scope of emissions covered, the level of individual engagement, and the rules and procedures for allocating, surrendering and trading carbon units. Despite the variation, the objective of all PCT schemes is to limit the overall carbon emissions within a society by engaging individuals in the process. All schemes proposed so far share common features: the scheme is mandatory, with no opt-outs; individuals periodically receive a carbon quota for free; for every activity that involves carbon use within the scope of the scheme, allowances are surrendered; the allowances are tradable in a new personal carbon market, allowances are reduced over time in line with national carbon reduction commitments.

PCT and equity

PCT embodies specific and explicit ideas about equity: it proposes that an equal allowance is fair. This is clearly debatable – and has been debated – both in principle and in terms of the consequences of equal allowances in a society where people's current emissions vary hugely, as does their ability to access lower carbon energy sources, technologies, practices and ways of life.

There have been two strands of applied research on equity and PCT. The first is distributional analysis on the effects on UK households. Modelling work has found PCT to be a progressive policy in which the poorer members of society are mostly 'winners', as their levels of emissions (from household and transport energy use) are generally lower. However, some low income households have high carbon emissions, and they would lose under PCT. The second strand is research on the public acceptability of PCT. A number of acceptability studies, using a wide variation in methods and sample types, have been undertaken. The results show the importance of fairness to public opinion. When PCT is

compared with carbon taxation (or other policies) it is usually preferred. For those who prefer PCT, its key benefits are seen as fairness and effectiveness. For those against, their main concerns are about implementation and unfairness. The fairness of PCT in practice would of course depend on detailed policy design, implementation and enforcement, as well as the principles on which it is based.

PCT effectiveness and efficiency

Equity, while crucial, is not the only attribute a successful policy requires. It should also be effective and efficient. PCT accesses a number of mechanisms to drive change: economic, psychological and social. It increases the costs of high personal carbon emissions, and rewards low emissions, it sets people targets and budgets and gives them timely feedback, and it strongly signals what constitutes a socially acceptable level of personal emissions. The costs of introducing and running PCT are disputed, and would depend very much on implementation details. PCT has the potential to be both effective and efficient.

PCT and political experience in the UK

PCT had a moment in the UK political spotlight in 2006/07 and the government commissioned research which reported in 2008. At that point, the government decided not pursue interest in PCT any further, largely due to concerns about public acceptability and costs. However, subsequent research has shown that the government's concerns about the public acceptability of PCT are not supported by the evidence and that PCT's costs may be considerably less than feared. Official assessment of PCT was undertaken at a time when very little research existed and the idea was in an early stage of development.

Final remarks

PCT encourages open discussion about who the 'winners' and 'losers' in a lower-carbon society would be, under what circumstances, and who might be compensated for their losses. It questions the capabilities of the current policy toolkit to deliver the radical changes needed. While PCT may not have all the right answers, it is a policy idea which raises many of the right questions for climate change mitigation.

Dr. Francois Fortier, United Nations Office for Sustainable Development (UNOSD)

Presentation title: 'Political economy: the missing knowledge of sustainability transitions'

Conference session title: Governance for radical mitigation (via weblink)

Biography:

Dr. François Fortier is Senior Expert with the United Nations Office of Sustainable Development, based in Incheon, Republic of Korea. Over the past 20 years, he has worked with the UN and NGOs and has taught at the University of Ottawa in Canada for six years and lectured at the Institute of Social Studies in The Netherlands in areas of information technologies for development, knowledge management and, more recently, on the climate, energy and food security crises. His current function is to support governments in transition

policies for sustainability. Dr. Fortier holds a Ph.D. in Political Science from York University in Toronto.

Extended abstract:

Government agencies, civil society and international organisations have made significant efforts in the past 25 years to nurture the social, economic and environmental dimensions of what has become the broad and imprecise paradigm of *sustainable development* (SD). An implicit, and sometimes explicit assumption by many such initiatives has been that technical knowledge is central to implementing SD, while remaining knowledge gaps are the chief obstacles in need of attention. Programmes have therefore often aimed at building the awareness, knowledge and capacity of policy stakeholders at all levels of governance, focussing on issues of energy, agriculture, water, or transportation. Much of this work, notably by United Nations entities, was defined within the framework of the 1992 Agenda 21, its 2002 Johannesburg Plan of Implementation, and the 2012 Outcome Document of the Rio+20 Conference, *The Future We Want*. Despite those efforts, a transition to sustainability is clearly happening much too slowly to address the convergence of social and economic crises with the trespassing of planetary boundaries.

Elucidating the reasons for systemic inertia in sustainability transitions, and questioning assumptions made on knowledge gaps, have therefore become urgent research questions. In fact, the intensity of capacity building activities over the past two decades, the availability of relevant knowledge at both conceptual and operational levels, and the technical and institutional strength already achieved by numerous policy actors – including in many developing countries – suggest that lack of knowledge is not the main, or even a significant, obstacle to sustainability transitions. Instead, this paper argues that it is not technical knowledge that is most dearly missing from sustainability transitions, but knowledge of political economy. The evidence suggests that a much better understanding of the latter is essential to enable fast transitions, allowing to map-out actors, their interests, strategies, relations and discourses, as they either hinder or foster transition politics and policies.

A strong corpus of political economy (including political ecology) has long studied and exposed those traits of actors. It has contributed to explain, well beyond the impact of knowledge and capacity, why such actors behave in certain ways or not. It offers critical perspectives and insights on sustainability transition strategies and activities that can greatly enrich the mainstream policy translation process. Yet, political economy has long been shunned by many developmental organisations, particularly intergovernmental ones, for being seen as “too political”, i.e. outside of their institutional comfort zone of diplomatic neutrality, consensus-building around lowest common denominators, and non-interference in national politics. While those reasons may indeed have motivated taboos and inaction, they have also been convenient pretexts to ignore the politics of neoclassical economics and developmental practices, and hence avoid confronting powerful global and national interests. At best, analyses and programmes that have recognised the ultimate role of politics in sustainability conclude with calls for the proverbial but elusive “political will”, without ever delving into what this means in power relations, struggles, alliances, and outcomes for the protagonists involved. Much of the SD debates and programming have therefore fallen well short of asking politically difficult questions that are nevertheless essential to foster “hard sustainability”, about consumption and lifestyles and, more importantly, about what those imply for resource allocation, wealth production, accumulation, distribution, and political power.[1]

In recent years however, this consensus of silence has slowly but steadily been eroded by the acknowledgement of the threat that un-sustainability presents to ecosystems and societies, and hence to capitalist economies, as sub-systems dependent on the former. The

very concept of political economy, in the classical meaning of both Smith and Marx as the study of power in production and distribution of wealth, is slowly re-entering the thinking and language of mainstream, largely neo-classical development practice. Many institutions, following neo-institutional theories, are now coming to terms with the fact that the politics of vested interests is a much more daunting obstacle to sustainable economics that they would have liked to admit. Such critiques have surfaced from brands unsuspected of radical political economy penchants, including the OECD[2] and the World Bank[3]. The *World Economic and Social Survey* 2011 and 2013[4] both address up-front issues of resource distribution, economic governance, as well as production and consumption patterns. UN-DESA also recently released several documents under its *Sustainable Development in the 21st Century* (SD21) project, seeking to inform the High-level Political Forum and Sustainable Development Goals processes. In introduction of the policymaker summary of the project *Back to Our Common Future* document, the authors state that:

> "for sustainable development to progress, its political nature has to be recognized. Decisions and courses of actions that are chosen every day by governments and international institutions are ultimately the outcomes of confrontations of different "world views" – reflecting different visions and interpretations of principles such as economic efficiency, equity, solidarity, empowerment, and justice, different views regarding how sustainable development should be pursued, and different views on the means through which specific issues (e.g. food security, climate change mitigation) should be addressed. Often, agreed courses of actions reflect a "mix" of different world views, sometimes resulting in inconsistencies and incoherence. Difficult issues are typically left "under the rug" for the benefit of reaching politically palatable consensus, resulting in watereddown blueprints that do not address systemic issues." (p. ii).

These positions reflect a momentum to lift political issues from "under the rug", and confront them openly within policy translation and policy-making circles usually impermeable to critical political economy. This paper therefore briefly reviews ongoing SD knowledge and capacity building initiatives, mapping actors to show what trends and momenta are merging, and shed light on remaining gaps in political economy analysis. It then argues that such emerging opportunities need to be seised by policy translation actors for explicit political-economy capacity building within sustainability institutions. This would go a long way in enabling "hard" transitions of the sort required by radical GHG mitigation plans.

References:

1 See notably Adams, W. M. (2009) Green Development: environment and sustainability in a developing world, New York, NY: Routledge.
2 OECD. Environmental Fiscal Reform for Poverty Reduction. DAC Guidelines and Reference Series. Paris: 2005, which explicitly discussed the winners and losers of sustainability reforms. This is again made explicit by OECD's Secretary General, Angel Gurría, in an address on 9 October 2013 to the LSE: http://www.oecd.org/about/secretary-general/secretary-generaloftheoecdinlondontodeliverlectureonclimatechangeon9october2013.htm.
3 World Bank. "Environmental Fiscal Reform: What Should Be Done and How to Achieve It." The International Bank for Reconstruction and Development / The World Bank, 2005, which also discussed environmental fiscal reforms, confronting the issues of political contexts and motives that enable or stall sustainability policies.
4 UN Department of Economic and Social Affairs (UN-DESA).

Trent Hawkins, Beyond Zero Emissions Inc.

Presentation title: 'Zero Carbon Australia (ZCA) Buildings Plan'

Author: Trent Hawkins and Patrick Heaps

Conference session title: Delivering radical mitigation 1 (via weblink)

Biography:

TRENT HAWKINS is a Mechanical Engineer and the lead author of the Zero Carbon Australia Buildings Plan, a 3-year long initiative of Beyond Zero Emissions, Inc. Prior to this he voluntarily contributed to the ZCA Stationary Energy Plan, and worked as a wind energy consultant. His role has involved leading the ZCA Buildings research with contributions from dozens of volunteers and pro bono consultants.

PATRICK HEARPS is a Research Director with Beyond Zero Emissions, Inc., previously Research Fellow in Energy & Transport Systems at the University of Melbourne's Energy Research Institute, and a chemical engineer for ExxonMobil Australia. He was a lead author on the Zero Carbon Australia Stationary Energy Plan, analysing the feasibility of renewable energy to meet 100% of Australia's energy needs. The Zero Carbon Australia Project is a collaboration between Beyond Zero Emissions, the University of Melbourne, and various other industry and academic institutions. It is the product of pro-bono contributions from dozens of engineers and scientists to collaboratively outline detailed, cost-effective and feasible solutions for decarbonising the Australian economy.

Abstract:

The Zero Carbon Australia (ZCA) Buildings Plan is the first comprehensive, nationwide retrofit plan for Australia's building sector and demonstrates how all existing buildings can reach zero emissions from their operation within ten years. It sets out how Australia can transform the building stock to reduce energy bills while improving comfort and worker productivity.

The Plan has undertaken extensive bottom up modelling of the residential and non-residential buildings stock across Australia's very different climate zones to estimate energy savings possible from applying a suite of known energy efficiency retrofits. It has been achieved with pro bono input from dozens of individuals and companies, including some of Australia's leading consultants in the field of building energy use.

The effect of these retrofits is reducing energy consumption from both residential and non-residential buildings by over 50%. The remaining energy requirements can be met with a combination of onsite renewable energy (mainly rooftop solar photovoltaics) and electricity from a 100% renewable grid, such as that outlined in the ZCA Stationary Energy Plan.

The proposed retrofits include (list is not exhaustive):

- improving building envelope thermal performance with measures such as insulation, enhanced glazing, draught-proofing
- replacing gas appliances with efficient electric alternatives: induction cooktops, heat pumps for space heating and hot water
- phasing in lighting and appliances based on the best technology available today.

The full ZCA Buildings Plan will contain costings and economic comparisons to business-as-usual, and analysis of the requirements to achieve the proposed retrofit program in ten years.

Dr. Jane Hindley and Professor Ted Benton, Essex Sustainability Institute, University of Essex

Presentation title: 'What would Churchill say? Political leadership, collective action and the framing of radical emissions reduction strategies'

Conference session title: Governance for radical mitigation

Biography:

JANE HINDLEY is a comparative, political sociologist and a member of the Red-Green Study Group, UK. She is a part-time lecturer in the Centre for Interdisciplinary Studies in the Humanities and member of the Essex Sustainability Institute, Essex University. She has taught courses on development, the environment, gender, the Enlightenment, and qualitative research methods. Jane's research has focused on social movements, indigenous peoples, ethnic minorities, and the environment in Latin America, the UK, and Taiwan. She has held visiting fellowships at the Centre for Advanced Studies in Anthropology in Mexico City; the US-Mexico Centre at the University of California-San Diego; and the Institute of Gender Studies, Kaohsiung Medical University, Taiwan. Her research in the 1990s focused on struggles for rights and citizenship in the context of social exclusion and regime transitions. Her current research project, *Resources of Hope*, documents grassroots environmental initiatives and considers their implications for cultural transformation, sustainable futures, and well-being. Jane has published a range of book chapters, journal articles, policy reports and review essays, including: 2011 with Ming-sho Ho 'The Humanist Challenge in Taiwan's Education: Liberation, Social Justice and Ecology", *Capitalism Nature Socialism*; 2007 "A Park for the Twenty First Century: Observations on the Transformation of Mile End Park" *Capitalism Nature Socialism*; 1999 co-editor with Wayne Cornelius and Todd Eisenstadt, *Subnational Politics and Democratization in Mexico*; 1996 "Towards a Pluricultural Nation: The Limits of Indigenismo and the Reform of Article 4", in Aitken, R. et al.*Dismantling the Mexican State*?

TED BENTON has written extensively on philosophy of social science, history of the life-sciences, social theory and Marxism. Since the 1980s his main focus has been on re-working the heritage of left theory in response to green thought and practice, and since 1992 this has been taken further through collaboration with others in the Red-Green Study Group. He is also a well-known natural history writer and photographer. UK. Publications include *Philosophical Foundations of the Three Sociologies* (1977), *Rise and Fall of Structural Marxism* (1984), 'Marxism and natural limits' (*New Left Review* 178), *Natural Relations: ecology, animal rights and social justice* (1993), *Social Theory and the Global Environment* (edited with M. Redclift, 1994), *The Greening of Marxism* (edited, 1996), *The Philosophy of Social Science* (with I. Craib, 2001, 2nd edn 2010), *New Naturalist: Bumblebees* (2006); *New Naturalist: Grasshoppers and Crickets* (2012). A recent comprehensive evaluation of his work is included in Moog, S & Stones, R. (eds) 2009 *Nature, Social Relations and Human Needs: Essays in Honour of Ted Benton*. Palgrave. His most recent publication is a critical biography of Alfred Russel Wallace: *Alfred Russel Wallace: Explorer, Evolutionist and Public Intellectual: a thinker for our own times?* (Siri Scientific Press, 2013). The book includes

extensive discussion of Wallace's ideas on a future decentralised environmentally sustainable and socially just social economy.

Extended abstract:

Social movement theory has shown that the way new demands and challenges are framed makes a crucial difference to political success and bringing about desired social change. This paper explores how radical emissions reduction strategies can be framed to foster acceptance, mobilise support, and challenge the status quo. It is organised in two main parts. Part one, building on recent studies (e.g. Weintrobe et al., 2013; Whitmarsh et al., 2011), characterises the ways climate change and incremental emissions mitigation have been framed in the UK over the last 10 years. We argue that high targets have not been matched by sustained policy and public education campaigns, and the issue has been relegated to individual choice and technocratic fixes, such as carbon-markets. In other words, it has been framed as either as a matter for experts or of consumer preference, rather than an urgent collective problem requiring collective solutions.

Part two starts by analysing Obama's June 25th 2013 climate change speech, which we suggest represents an important precedent. We highlight the way Obama, after confronting denialists head on and linking recent extreme weather in the US with climate science, explicitly appeals to both intergenerational justice and core elements of American nationalism to frame combating climate change as a historic collective project. We then ask what are the historical precedents, cultural specificities and traditions that might be used to frame and legitimise radical emissions reduction strategies in Britain, considering, for example, the re-ordering of economy and society during and after World War II.

Alice Hooker-Stroud, Centre for Alternative Technology

Presentation title: 'Zero Carbon Britain (Energy)'

Authors: Kellner T, James P, Hooker-Stroud A, Harper P and Allen P

Conference session title: Pathways for radical mitigation

Biography:

ALICE HOOKER-STROUD has Master's degrees in Physics and in Earth Systems Science. She has contributed to work modelling seasonality in fossil fuel CO_2 emissions; helped set up and support a research group at the Catalan institute of Climate Science (IC3) in Barcelona that focusses on regional climate variability; and was the primary author of a set of climate science factsheets designed for campaign groups. She currently works as Communications Officer for the Zero Carbon Britain project, having co-ordinated the most recent phase of research and publication process of the latest report – *Zero Carbon Britain: Rethinking the Future*. She believes that evidence-led policy supported by society is required to make the transition to a sustainable world and currently enjoys living in – and her ability to correctly pronounce – Machynlleth, in Mid Wales.

Holding an Honours degree in Electronic and Electrical Engineering, PAUL ALLEN joined the Centre for Alternative Technology (CAT) in 1988. He assisted the development and

production of a wide range of renewable energy systems and helped develop CAT's spin-off engineering company, Dulas Ltd. In 1995 he became CAT's Communications Officer, and is currently CAT External Relations Officer and Project Co-ordinator of the Zero Carbon Britain (ZCB) project. Paul is also Member of Wales Science Advisory Council (2010), board member of the International Forum for Sustainable Energy (2008) and a Climate Change Commissioner for Wales (2007). Under Paul's co-ordination of the research and communication phases of the ZCB project, the following ZCB research team was assembled in the summer of 2012. The members of the team undertook the majority of the research that has gone into the creation of the scenario for this report here at the Centre for Alternative Technology (CAT).

Extended abstract:

The presentation today will briefly cover the framing of the Zero Carbon Britain scenario development. It will focus on the energy system in the scenario, providing an overview of our hourly energy model and the implications of the results for rapid decarbonisation strategies in the UK.

Zero Carbon Britain (ZCB) is an initiative from the Centre for Alternative Technology (CAT). The project looks at the interplay between land use, energy production, the built environment and transport, to present an integrated and technically robust scenario of a fully decarbonised Britain. The aim of the project is to demonstrate that rapid decarbonisation is possible, in order to support and inspire the requisite action to achieve a positive zero carbon future.

Zero Carbon Britain: Rethinking the Future is the third report researched and published by the project, and was launched in July 2013. This latest report builds on previous ZCB scenarios, includes the latest knowledge across a wide range of disciplines, and integrates new research in two key areas – 'keeping the lights on' with a variable renewable energy supply, and 'feeding ourselves properly' on a low carbon diet.

Our scenario demonstrates we can rapidly reduce UK greenhouse gas (GHG) emissions to net zero using only current technology. We can do this whilst maintaining a modern standard of living, and meeting our energy demand at all times with 100% renewable UK energy sources.

The scenario first assesses the extent to which it is possible to reduce our energy consumption, looking at current technology and behaviour change to 'power down' our energy requirements for buildings, industry and transport. In all areas, the widespread (though not total) electrification of systems allows not only that energy can be supplied more easily from renewable sources, but also affords huge energy savings. Looking at assessments of the technical potential for various renewable technologies in the UK then allows us to make an assessment of the amount of zero carbon energy that could be supplied to the UK. We find, as have many others, that we can easily meet this reduced annual energy demand of the UK from our renewable assets.

The key challenge in making the scenario work has been to show how the large surpluses and shortfalls arising from an ever-changing energy demand can be reliable met using variable renewable generation. Hourly modelling covering a period of 10 years using UK weather data shows how the changing output of our renewable generation systems compares with the shifting demand for energy during periods of warm and cold weather. This allows us to identify times when our generation systems produce an excess of energy, and others when they fall short of demand, and to combine various methods of dealing with this variability.

We find that in our scenario electricity supply meets or exceeds demand 82% of the time. Shifting energy demand by using 'smart' appliances; employing demand management practices; and using short-term energy storage (for hours or days) such as pumped storage, batteries, heat storage and hydrogen; means supply meets demand only a further 3% of the time. Using long-term energy storage (for weeks or months) in the form of carbon neutral synthetic gas – created from excess electricity and biomass grown in the UK – is required to meet demand the remaining 15% of the time. This represents only 3% of total electricity supply, but is crucial to managing variability as it can be dispatched quickly as and when necessary.

An important finding of this research is that constant 'baseload' power (for example, from nuclear or coal-replacement biomass plants) is not helpful in balancing a variable system, and leads to further overproduction 82% of the time when renewable systems already meet demand. If we presuppose that any future energy supply will consist of a significant proportion of renewable generation, then this finding has significant implications for current UK energy infrastructure development and policy decisions today.

The production of carbon neutral synthetic fuels (both liquid and gaseous) not only supports a variable energy supply, but also allows us to cater for some energy demands that cannot currently be electrified – for example in transport and industry. These fuels are therefore key to a functional, fully decarbonised Britain. Their 'carbon neutrality' does however depend heavily on our ability to regulate and enforce sustainable management of the sources of biomass. With much contention over the implications of biomass sourcing globally, we choose to supply our own biomass from within the UK.

We examine the current use of UK land to identify changes that pull our decarbonisation scenario together – allowing us to reduce emissions from agriculture, enhance natural systems that capture carbon in the UK, provide a healthy and balanced diet for the UK population, and biomass to complement our energy system.

The Zero Carbon Britain project is now in a communications phase to disseminate the findings of our research to a wide community of audiences – business and industry, policymakers, campaign organisations, educators and researchers. More information is available on our website www.zerocarbonbritain.org Please feel free to use our work in yours, and get in touch if we can help in any way.

William Lamb, Tyndall Manchester

Presentation title: 'Transitions in pathways of human development and carbon emissions'

Conference session title: Lifestyles and emissions

Biography:

William is a PhD researcher at the Tyndall Centre for Climate Change Research at the University of Manchester. He has a background in ecological economics and in consulting for the decentralised energy sector. William's research is focused on the interaction between measures of development achievement and national carbon emissions, with respect to the historical and future pathways of countries. This research is primarily quantitative, using

statistical methods, but draws on literatures in ecological economics, international development and political ecology.

Abstract:

Radical emissions reductions require a new perspective on plausible outcomes of low-carbon development achievement. A narrow focus on income measures of national progress may be difficult to reconcile with deep emissions reductions, but a broader scope, measuring real development, reveals opportunities for sustainable transitions. In this paper, I highlight 20 countries achieving above 70 years of life expectancy, yet lower than 1 ton of carbon emissions per capita ("Goldemberg's Corner"). To explore their relevance for other nations, the underlying drivers of carbon emissions are estimated, and their cross-national distribution quantified using cluster analysis. Unlike previous studies, trade-corrected consumption based carbon emissions are used to account for potential carbon leakage between nations. Five clusters of countries are identified with varying patterns of drivers and highly differentiated outcomes of life expectancy and carbon emissions. Four clusters intersect within Goldemberg's Corner, suggesting diverse combinations of drivers may still lead to sustainable outcomes, presenting many countries with an opportunity to follow a pathway towards low-carbon human development. By contrast, within Goldemberg's Corner, there are no countries from the core, wealthy consuming nations. The results reaffirm a need to address economic inequalities within international agreements for climate mitigation, but acknowledge plausible and accessible examples of low-carbon human development for countries that share similar underlying drivers of carbon emissions.

Professor Diana Liverman, University of Arizona

Presentation title: 'The potential for radical emission reductions in the American West'

Conference session title: Behaviours and political & social norms (via weblink)

Biography:

Diana Liverman is the co-director of the Institute of the Environment at The University of Arizona and a Regents Professor in the School of Geography and Development. She is the former director of Oxford's Environmental Change Institute where she worked with the Tyndall Center. Her research focuses on the human and social dimensions of environmental issues including vulnerability and adaptation to climate change, environmental change and food security, and international environmental policy. She has authored or edited seven books and more than 100 journal articles and book chapters. She is the recipient of the Royal Geographical Society's Founders Gold Medal and the Distinguished Scholarship Award of the Association of American Geographers for her contributions to understanding the human dimensions of global environmental change. She has been an active member of national and international advisory committees on global environmental change including chairing committees for the US National Academy on the Human Dimensions of Global Environmental Change and America's Climate Choices and international committees for the Global Environmental Change and Food Systems (GECAFS) program, the Inter American Institute for Global Change, and the IHDP Earth Systems Governance project. She recently co-chaired the transition team for ICSU and other organizations to create a new international science program 'Future Earth' and is a member of the advisory committee for the US National Climate Assessment. She is the co-editor of the Annual Review of Environment

and Resources and sits on editorial boards for the journals Global Environmental Change and Nature-Climate Change.

Abstract:

This paper will examine the geographies of greenhouse emissions in the western USA and the varying level of commitment and shift to lower emissions. If we include Alaska and Texas within the 13 western states this region contributes 30% of US and 5% of global emissions. The region includes more than a third of the top 50 point sources (EPA, 2011) including 10 massive thermoelectric plants that together produce 145mmt of direct emissions. In terms of policy commitment the region includes California, with a target of reducing emissions 80% by 2050, and Texas, which has no target.

I will review the potential for more rapid reductions, the policies and trade offs this might involve, and the barriers and opportunities this will present. This will include information on public and political perceptions in the region, the potential and implications of a shift away from fossil fuels, the possibility of technology innovation within the region, and the actions being taken by local governments and individuals to reduce their emissions.

Larry Lohmann, The Corner House

Presentation title: 'Identifying often-overlooked alliances for change'

Conference session title: Mobilising action amongst non-government actors

Biography:

Larry Lohmann works with The Corner House, a solidarity and research group based in Dorset, UK. He spent most of the 1980s working with environmental movements in Thailand and, with his Corner House colleagues, continues to collaborate with friends in Asia, Latin America, Asia and elsewhere on a range of social issues. He is the editor of *Carbon Trading: A Critical Conversation on Climate Change, Privatization and Power* (2006), author of *Mercados de Carbono: La Neoliberalizacion del Clima* (2012), and co-author of *Energy Security: For Whom? For What?* (2012), *Energy Alternatives: Surveying the Territory* (2013) and *Pulping the South: Industrial Tree Plantations in the Global Paper Economy* (1996), among other books. In addition to contributing chapters on climate change politics to a number of books, he has published articles on the topic in journals such as *Carbon & Climate Law Review; Accounting, Organisations and Society; Science as Culture; Development and Change; New Political Economy; Global Social Policy; Socialist Register; Development; Race & Class; New Scientist; Development Dialogue; Capitalism Nature Socialism;* and *International Journal of Environment and Pollution.*

Extended abstract:

The climate debate among intellectuals in Europe and elsewhere in the global North presents a striking peculiarity that needs to be addressed if the discussion is to move forward. On the one hand, the science detailing the likely physical effects of the atmospheric concentrations of certain types of molecule is quite advanced. So is the understanding of the

reductions that must be made in the emissions of those molecules if these effects are to be reduced or moderated (Anderson and Bows 2011).

On the other hand, accounts of the *origins* of those molecular concentrations that are currently dominant in the North tend to be exceedingly rudimentary, undeveloped and lacking in rigour, as well as often mutually contradictory. As a result, there is a huge amount of confusion among Northern intellectuals about what actions and alliances are likely to be most effective in bringing about radical emissions reductions.

Perhaps the most rudimentary of all of the theories states simply that our current predicament is caused by "too many molecules" being emitted. Tautological though it may be, this theory it is far from harmless: its molecular focus invites the view that the "radicalness" of reductions can be assessed by measuring how many molecules are kept out of the atmosphere. The problem here is obvious, and can be demonstrated simply by noting, for example, that the current financial crisis has (temporarily) reduced far more molecule flows than any other climate policy currently active (e.g., the EU ETS), yet is not accompanied by any shift away from fossil fuels whatsoever.

Slightly more sophisticated is the theory that, desultorily casting about for a cause of this excess of molecules, locates it in an undifferentiated humankind. This is the discourse of the so-called "Anthropocene" – a term put into circulation by ecologist Eugene Stoermer and atmospheric chemist Paul Crutzen. Here too the limitations are obvious. Far from being excessive emitters, most of humanity today, as in the past, engage in various activities that circumvent, resist or refuse the unequal industrial processes that result in high concentrations of GHGs. The "anthropocene" theory of global warming, in the words of energy historian Andreas Malm, "obfuscates and mystifies its character as a social and historical process, thus obstructing requisite political action" (Malm 2012).

A very slight advance is made by the theory that attributes the excess molecules to the nation-states within whose borders they are emitted. While this theory has been adopted by the UNFCCC and shapes the methodologies of IPCC scientists, it is rightly criticized for obscuring "offshored" emissions embodied in consumer goods (e.g., Davis and Caldeira 2010). One corrective for this attempts to tabulate the destinations rather than the origins of products with high emissions content, locating the cause of excess emissions in "consumers", "consumerism", or the "iron cage of consumption" (Jackson 2011). The obvious difficulty here is that owners and managers of production, as well as their investment decisions about how best to combine cheap labour with fossil-fuelled machinery, are thereby rendered invisible (Foster, Clark, and York 2010). Instead, disproportionate sovereignty is attributed to consumers, who are pictured, implausibly, as causing emissions to zoom across oceans simply "by standing in front of shelves and picking cheap Chinese commodities rather than expensive domestic ones" (Malm 2012: 151).

Still another set of theories attributes excess emissions to "market failures", "governance failures", "bad policy choices" and the like. The implication is that any necessary emissions reductions can be made through improved pricing, commodification of pollution, ecological modernization and so forth, once "denialism" and "lack of political will" are overcome. The problem with these theories is that they assume what has to be proved: that excessive emissions result from a breach in the logic of "business as usual" rather than as part of the dynamics of a pattern of fossil-fuelled capital accumulation that began with the belated adoption of steam by mid-19th century British industrialists as an instrument for shifting the balance of class power – a pattern that has continued up through the migration of industrial investment toward sites of cheap labour exploitation in coastal China that underlies much of the post-2000 spike in carbon dioxide emissions.

Moving forward from the current extremely rudimentary and nonproductive phase of theory construction toward accounts that point toward effective means of radical emissions reduction will require greater rigour in examining such dynamics (see, e.g., Hornborg, Bunker, Illich, Caffentzis 2013, Huber, Moore, Harvey). Above all it will require abandoning the prevailing ideology that radical emissions reductions involve technical plans executed by expert elites through a pre-existing political infrastructure (Mitchell, Scott). Northern intellectuals' efforts both to achieve a more sophisticated scientific understanding of the origins of excessive greenhouse gas emissions and to support strong strategies for confronting them cannot be separated from efforts to build new alliances with, and cultivate new loyalties toward, those whose livelihoods have always depended on engaging with the political issues around fossil fuels. Instead of reinforcing an unfruitful plan/implementation dichotomy, such a "science as solidarity" stance (Rorty xxxx) would involve joining with existing movements around fossil fuels in paying careful attention to the conflicts surrounding the development of the modern concept of energy over the past two centuries; the contemporary configuration of social forces on the terrain of enclosure, economic and financial crisis; and movements to defend, rebuild and create commons. Great potential exists for new forms of political alliance-building around keeping fossil fuels in the ground, but they will require scientists and other intellectuals joining in mutual-learning processes with groups that they may hitherto not have been accustomed to working closely with – for example, anti-privatization movements, indigenous anti-extraction movements in the Andean region, radical economists, Occupy, La Via Campesina, anti-austerity movements, land rights movements, forward-looking trade unions, movements defending forest and water commons in South and Southeast Asia, Transition Towns, environmental justice communities in Southern California, and so forth. One of the biggest steps toward the alliance- and theory-building that is possible is simply to recognize the wide base of movements already working effectively toward the necessary social and political changes.

References:

Anderson, K. and Bows, A. (2011). Beyond "dangerous" climate change: Emission scenarios for a new world. *Philosophical Transactions of the Royal Society A*, 369, 20-44.

Bunker, S. and Ciccantell, P. S. (2005) *Globalization and the Race for Resources.* Baltimore: Johns Hopkins University Press.

Caffentzis, G. (2012) *In Letters of Blood and Fire: Work, Machines and the Crisis of Capitalism.* Oakland: PM Press.

Davis, S. J. and Caldeira, K. (2010) Consumption-based accounting of CO_2 emissions. *Proceedings of the National Academy of Sciences* 107, 5687-5692.

Foster, J. B., Clark, B. and York, R. (2010) *The Ecological Rift: Capitalism's War on the Earth*. New York: Monthly Review Press.

Harvey, D. (2006) *Limits to Capital.* London: Verso.

Hornborg, A. (2012) *Global Ecology and Unequal Exchange: Fetishism in a Zero-Sum World*. London: Routledge.

Huber, M. T. (2009). Energizing historical materialism: Fossil fuels, space and the capitalist mode of production. *Geoforum* 40, 105-115.

Illich, I. (2009) The Social Construction of Energy. *New Geographies* 2, 13-19.

Jackson, T. (2011) *Prosperity without Growth: Economics for a Finite Planet*, London: Routledge.

Malm, A. (2012) China as Chimney of the World: The Fossil Capital Hypothesis. *Organization & Environment* 25 (2), 146 –177.

Mitchell, T. (2002) *Rule of Experts: Egypt, Technopolitics, Modernity,* Berkeley: University of California Press.

Moore, J. W. (2011) Ecology, Capital and the Nature of Our Times: Accumulation and Crisis in the Capitalist World-Ecology, *Journal of World-Systems Research* 17 (1), 108-147.

Rorty, R. (1990) *Objectivity, Relativism and Truth*, Cambridge: Cambridge University Press.

Scott, J. C. (2012) *Two Cheers for Anarchism: Six Easy Pieces on Autonomy, Dignity, and Meaningful Work and Play*, Princeton: Princeton University Press.

Miriam Lyons, Centre for Policy Development

Presentation title: 'The political economy of climate change advocacy'

Authors: Miriam Lyons and John Wiseman

Conference session title: Mobilising action amongst non-government actors (via weblink)

Biography:

Miriam Lyons is Executive Director of the Centre for Policy Development, a public interest think tank in Australia. The Centre for Policy Development's Sustainable Economy program looks at how to transform Australia's economy to flourish within environmental and resource limits. She is a regular guest on the ABC TV shows Q&A and The Drum and co-edited the book 'More Than Luck: Ideas Australia needs now' with Mark Davis. Miriam was a delegate to Australia's 2020 Summit and was profiled in the Thinkers category of *The Australian*'s Emerging Leaders series, as a 'Woman Shaping Australia' in *Madison Magazine* and as a '2010 True Leader' in *the Australian Financial Review*. She is on the board of the Centre for Australian Progress and the advisory committee of the Centre for Cosmopolitan Civil Societies at the University of Technology Sydney. Miriam has a passion for making good ideas matter. Formerly policy coordinator for NewMatilda.com, she is a frequent public speaker and commentator on a diverse range of Australian policy debates.

Abstract:

The political economy of the non-profit sector is well suited to delivering change through a series of incremental reforms. In general, it is poorly suited to the task of bringing about radical or systemic transformations. The authors will briefly discuss three factors that make it hard for many non-government organisations (NGOs) to be effective advocates for radical emissions reductions:

* The role of philanthropists, governments, and mass-market fundraising appeals as the source of NGO resources

* The cultivation and maintenance of 'voice' in the media landscape

* The cultivation and maintenance of 'access' in the political landscape

This will be followed by a discussion of options for overcoming these obstacles, in light of existing evidence on effective climate change advocacy. The authors will draw on research by Centre for Policy Development fellow John Wiseman for his 'post-carbon pathways' project. They will focus on ways to bridge the gap between a) post-carbon transition plans that are in line with scientific evidence but pay little attention to political feasibility and b) less ambitious emissions reduction plans that are politically feasible but pay little attention to scientific evidence on the need for more rapid transitions.

Ruth Mayne and Jo Hamilton, Environmental Change Institute, The University of Oxford

Presentation title: 'Scaling up local action'

Conference session title: Mobilising action amongst non-government actors

Biography:

RUTH MAYNE is involved in investigating the effectiveness of six (DECC funded) communities in changing local energy behaviors and reducing local energy use and carbon emissions, and their contribution to systemic change. Current interests include understanding influences on household energy behaviour and use, change theories and strategies and government energy policy. She has a background in sustainable development.

JO HAMILTON: My research focuses on community-led energy projects, local energy governance, and home eco-renovation. Within these projects I am exploring how social learning and social networks influence energy behaviours, what role the arts play in engaging individuals and communities with climate change and energy, and what resources community groups need for evaluation.

Abstract:

We need to rapidly accelerate and scale up mitigation to avoid dangerous climate change. This will involve decarbonising the energy supply, reducing energy demand and increasing energy efficiency. Such changes require finance, public acceptance and action by all sectors of society. Change will therefore require a combination of mutually reinforcing top down and bottom up action. The fairness of policy and programmes will also be key in winning public support.

In relation to domestic carbon reduction, we have some of the policies and many of the technologies we need. We also have unusually high levels of local action with local actors playing distinctive and important roles. But there are two major constraints. First, the policy and incentive framework is not adequately addressing the structural barriers that individuals and communities face in reducing their energy use. Second, despite the government rhetoric on localism, local actors are currently seriously underfunded, restricting the reach, scale and speed of action. There is hence a risk that government is transferring risk and responsibility to them without a parallel transfer of budget.

The paper assesses the roles played by local actors, their achievements in energy reduction, and their potential to scale up. Using an analogy with the infrastructure devoted to community level sport, it argues for government investment in and resourcing of the core roles of local actors. It also argues for greater leadership by government, a clearer call to action on climate change and greater use of the policy instruments at its disposal.

Neil McCabe, Green Plan Manager, Dublin Fire Brigade Training Centre

Presentation title: 'Case study: Kilbarrack Fire Station'

Conference session title: Delivering radical mitigation 2

Extended abstract:

Dublin Fire Brigade is the largest fulltime brigade in the Ireland with over 1000 personnel. There are 12 full-time stations and 2 retained stations these being located in north county Dublin at Skerries and Balbriggan.

Neil McCabe has written and implemented the Green Plan for Dublin Fire Brigade. This project is based on actions that took place at Kilbarrack Fire Station, the World's first Carbon Neutral Fire Station. The focus was to decrease the energy spend and decarbonise as much as possible. The project has taken a holistic approach to the Fire Station as an exemplar retrofit process across the following seven themes: Energy: Water: Waste: Biodiversity: Transport: Society: Procurement. Achievements include a 90% reduction in water consumption and more than 80% reduction in energy consumption.

''Neil McCabe is a full-time fireman in Kilbarrack Fire Station and has demonstrated a self-learnt and in-depth knowledge of energy conservation and sustainability. He has undertaken extensive research in these subject areas. Neil is using Kilbarrack Fire Station as a test bed, he has achieved significant reduction in the amount of energy used there and the money saved has been ring-fenced and re-invested in that Fire Station and other Fire Stations in Dublin. He has proved that his Green Plan works.''

SEAI Sustainable Energy Authority of Ireland

Kilbarrack Fire Station is the World's first Carbon Neutral Fire Station. There are over 300 completed retro fit and environmental projects finished to date. Running costs have been reduced by more than €50,000 per annum since the retro fit project began.

The Green Plan is now being rolled out across the whole of Dublin Fire Brigade and in other Dublin City Council buildings, including their Swimming pools and Leisure Centres. All actions are monitored and verified by independent SEAI officials.

This involves IPMVP at all stages of the projects. Perhaps the biggest achievement now is that DFB has partnered SEAI and has committed more then €1.3M from ring fenced energy savings created using the Green Plan: to spend on the upgrade of two of our Northside of Dublin Fire Stations. More over this process is being run through the Better Energy in the Community Scheme (BEC) and will have major impacts on our local communities at each Fire Station.

Most importantly though is that we are throttling towards 2020 way ahead of the 33% Energy and Carbon targets set by the Irish Government and this is all because of a simple "behavioural change" idea to collect used batteries in Kilbarrack Fire Station over five years ago.

The Green Plan has also moved across to the Private Sector as a Business Plan and businesses are taking actual actions to lower their Carbon production, increasing their energy efficiency and lowering their financial running costs.

Some of the achievements in Kilbarrack Fire Station so far:

- Gas consumption has reduced by over 97%
- Electricity consumption has been reduced by 80% per annum
- Micro generation wind turbines (as part of a grid tie and Green Procurement Project) are supplementing the energy spend most of the time.
- 80% of the Stations hot water is produced daily by the thermodynamic panels. These panels were the first of their kind in Ireland and were manufactured specifically for Kilbarrack Fire Station.
- Water consumption has been reduced by 1,500,000 litres Per Annum. The cost of water to and from the station has dropped by 90%.

By **analyzing** the Energy of the Station first, then **reducing** the energy spend thanks to the use of renewable such as heat pumps and LEDs and finally **producing** energy, Kilbarrack is a genuine flagship for innovation.

There are over 300 completed projects in Kilbarrack. The intention has always been that Kilbarrack is a flagship for ideas and innovation and a test bed for green procurement, local job creation and support. Such as the waste water treatment plant and the rain water harvesting tank. “I have built these projects as a visual to help people understand the sustainable and financial aspects of the Green Plan. Our Thermodynamic Solar Collectors are placed in a North East aspect and are not mounted to the roof of the Station. I enjoy being able to demonstrate that the Panels actually use wind and rain to make heat. They do not need to face the sun”.

Neil was honoured last month to receive a visit to Kilbarrack Fire Station by the EU Commissioner for Climate Change **Ms Connie Hedegaard**. The Commissioner had specifically asked to meet Neil in Kilbarrack and to be given a tour of all the innovative projects that are happening there. This was captured on RTE National News. The Commissioner went on to give interviews about the effect the Green Plan for Dublin Fire Brigade has already had across the EU thanks to a project “a world you like a climate you like.

The Green Plan has seen success with many National and International awards in the last years: the first award was the National Green Leader Award in 2011 for Neil McCabe. They have all given Dublin Fire Brigade the platform to raise its profile and be seen as Genuine Sustainable person based environmental Champions and not just a Fire Service. This has brought unquantifiable added value to Dublin Fire Brigade. This has also raised Neils profile and has encouraged him to push himself further to deliver and implement his research and application, for the good of the environment.

“I work a full time shift as a Fire Fighter (including working nights) and I keep all my projects running live. I have a very strong team around me in Kilbarrack Fire Station where I am based and I have Green Plan advocates all over Dublin Fire Brigade in every Station. These people help me to get the message out that reducing energy saves money, that money can be reinvested in Dublin Fire Brigade and support jobs, while lowering our carbon footprint and affecting Climate Change”

Dr. Christopher Shaw, Science and Technology Policy Research, University of Sussex

Presentation title: 'Generating public support for radical emissions reductions through a radical reframing of climate risks'

Conference session title: Behaviours and political & social norms

Biography:

I am an inter-disciplinary researcher with over seven years experience examining the relationship between the communication of uncertainty in climate science and levels of public engagement with climate policy. My expertise is in the areas of policy analysis, science and technology studies, energy policy, public understanding of science, discourse and narrative analysis, cultural anthropology, and participatory research. I am currently Visiting Fellow, Science and Technology Policy Research, where I have recently been involved in the 'Politics of Low Carbon Innovation' project, using the techniques of discourse analysis to understand the role of narratives in the building of protective spaces for the development and diffusion of low carbon technologies. Other recent research has included producing for the Institute of Development Studies a report synthesising research findings from participatory studies, to inform the post-2015 development agenda. I am about to begin a one year fixed term Research Assistant position with the Environmental Change Institute at Oxford University, as part of the *Climate Crunch* project. I will also shortly start a short-term research contract as part of the *Climate change as a complex social problem* programme at Nottingham University, analysing the relationships between international climate policy and national climate policy in the UK and Netherlands.

Extended abstract:

This presentation argues it will not possible to build meaningful engagement with a radical emissions reduction programme without greater public involvement in deliberations on acceptable levels of climate risk. Policy documents construct climate change as a phenomenon with a single global dangerous limit of two degrees centigrade of warming above the pre-industrial average. With the chances of keeping warming within two degrees now rapidly receding, a debate is beginning about what, if anything, should replace the two degree dangerous limit idea. Though organisations such as the IPCC, UNFCCC and EU have long argued that defining an acceptable level of climate risk is a value choice to be deliberated on openly and democratically, no such public deliberation has taken place. Instead discussion of the two degree limit has been marginalised within the public sphere and, where the topic is mentioned, it is described falsely as a limit identified as dangerous by climate scientists. There are substantive reasons why the climate risk debate should be inclusive – opportunities for building positive public engagement will be strengthened if people are allowed to deliberate on the primary and central questions asked by climate change, namely a) how should we live, given the enormity of the risks being generated by current social and economic patterns of activity and b) what level of harm is an acceptable price to pay for the reproduction of those activities? My talk will begin by presenting the arguments for greater public deliberation on acceptable levels of climate risk, before drawing on the theories of narrative rationality and narrative policy analysis to demonstrate that involvement in such debates does not require scientific expertise. I then finish with the suggestion that a re-purposed version of the DECCC MY2050 calculator offers a potential mechanism for opening up the debate about acceptable climate risk to a much larger number of citizens than have hitherto engaged with this issue.

A decision making process which presents itself as based on expert knowledge necessarily blocks participation for the average citizen. However, determining an acceptable level of

climate risk is best understood as a post-normal science, led by a process of normative reasoning supported by scientific knowledge. The insights which emerge from this reasoning can be expressed through the kind of narrative rationality that most humans employ on a continual basis as social actors. The scenarios which emerge from a process of normative reasoning with citizens can, through narrative policy analysis, be compared to policy narratives to reveal the role of politics and power in framing the realm of the possible in climate policy. Deliberating on climate risk through narratives is not a divergence from current processes for defining acceptable levels of climate risk - within the climate science and policy community the two degree idea is widely recognised as a fiction. There is nothing intrinsically wrong with operating on the basis of fiction; what is important that fictions are recognised as such. This then opens the door to broad public participation in deliberation on climate risk, because everyone has a story they can tell about the future they want. It is anticipated that a broader awareness of the uncertainties surrounding definitions of dangerous climate change would strengthen public engagement because research shows that without an understanding of uncertainty in climate projections the public cannot properly understand climate risk. Advocates of the two degree limit defend presenting the two degree dangerous limit as a non-negotiable certainty partly on the basis that it provides an easily communicable symbol for complex and uncertain determinations about future climate impacts. This message provides a simple rationale for publics being asked to make sacrifices in the name of a safe climate. Given how little public scrutiny the subject receives, this justification must be questioned, especially in light of recent evidence suggesting a very low awareness amongst the public of what governments have declared to be the dangerous limit to climate change.

Engaging publics in narrative policy analysis of climate risk policy would initially require an iterative and intensive series of deliberative workshops under the guidance of skilled facilitators; an expensive and time consuming process which could not be made available to everyone. The task then becomes one of taking the insights generated in an exploratory series of workshops to scale up the deliberative process to allow broad engagement on a question which implicates all citizens of the world. The DECCC MY2050 Pathways software highlights a potential means for reaching a wide audience. The MY2050 Pathways allows users to choose from a mix of technologies in order to meet pre-determined and unexamined ends, namely the emission targets deemed necessary to avoid dangerous climate change of two degrees centigrade. Taking the basic methodologies informing that interface, and applying them to the foundational question of why two degrees would offer users the opportunity for a deeper engagement with the issues than the objectives of the current MY2050 calculator. The variables could be lifestyle choices (relating to mobility, food, consumption and habitation), the outcomes would be the temperature increase that would result from everyone sharing the chosen lifestyle, and the expected biophysical impacts projected to arise from that amount of warming. The impacts would be expressed for the region local to the user, making the issue of climate harm seem less distant both temporally and geographically, and more rooted in the user's immediate environment.

It is hoped such a process would result in greater awareness of the difficulties in defining two degrees as the point at which dangerous climate change begins, and the enormous social changes needed even to have a 50% chance of avoiding such impacts. This awareness could build greater trust in the climate policy deliberation process, allow for more openness in communications about climate policy, and a greater willingness to accept a more fluid and urgent climate policy framework, given our incomplete knowledge of future climate impacts.

Andrew Simms, NEF/Global Witness

Presentation title: ‘A Green New Deal: Historical precedent and current potential for rapid economic adjustment’

Conference session title: Understanding the policy context

Biography:

Andrew Simms is the author of several books, including 'The New Economics', 'Ecological Debt' and 'Tescopoly'. He is chief analyst on the environment at Global Witness, a nef Fellow (new economics foundation) and was nef's policy director for over a decade, also founding its work programme on climate change, energy and interdependence. He trained at the London School of Economics and was described by New Scientist magazine as, 'a master at joined-up progressive thinking.' Andrew co-authored the ground-breaking Green New Deal, was one of the original organisers of the Jubilee 2000 campaign to cancel poor country debt, co-founded climate campaign onehundredmonths.org and devised 'ecological debt day' as a simple indicator of living beyond environmental means. He coined the term 'Clone Towns' in a long-term programme of work at nef on local economic decline and regeneration. After witnessing at first hand over two decades of failed international efforts on problems ranging from extreme poverty to climate change, his latest book 'Cancel the Apocalypse: the New Path to Prosperity' (2013) is the result of a search for something better.

Abstract:

Rapid emissions reduction has to be achieved in the context of electoral democracy and a medium-to-long term economic crisis triggered by the banking failures of 2007-2008. In these circumstances an approach that can best respond simultaneously to economic, social and environmental needs will minimise likely opposition. Further, an approach is desirable with the potential to align interests to present a sufficient countervailing force to short-term financial markets. In that light, this paper argues for a policy vehicle of a 'green new deal' combining, but not restricted to, a mixture of financial sector re-regulation and innovation with stimulus spending on energy demand reduction measures and fossil fuel substitution. It invokes particular lessons, both postive and negative, from a range of historical examples. These include: Roosevelt's 'New Deal' in the United States in response to the Wall Street Crash of 1929, the British experience of economic and behavioural change in the period immediately before, during and after the Second World War, and instances of economic change linked to the end of the Cold War. Themes explored include the scale and speed of mobilisation, problems with generating the consensus for action and general acceptance of policy measures relating to behaviour change, and their perceived fairness, resistance to economic measures deemed necessary, and emergent possibilities linked to the experience of collective action. While the contemporary challenge of radical emissions reduction is particular, a green new deal, informed positively and negatively by past experience of rapid economic adjustment most likely to succeed on technical, economic and poltical grounds.

Professor Clive Spash, WU Vienna University of Economics and Business, Institute for the Environment and Regional Development

Presentation title: 'Myths in the political economy of radical greenhouse gas emissions reductions'

Conference session title: Framing and barriers to radical mitigation

Biography:

I am an economist who writes, researches and teaches on public policy with an emphasis on economic and environmental interactions. My main interests are interdisciplinary research on human behaviour, environmental values and the transformation of the world political economy to a more socially and environmentally just system. Over 30 years, I have worked on a range of subject areas and topics from the economic impacts and control of acidic deposition through atmospheric and plant science relating to urban pollution impacts on agriculture to the economics and ethics of human induced climate change and the plural values related to biodiversity. This has also involved moving away from mainstream environmental and resource economics, looking at links with natural sciences, understanding applied ethics, exploring models of democracy and public participation in political science, and linking with social psychology to develop models of human behaviour and motivation. For some time now, I have pursued this interdisciplinary work within the context of ecological economics and more recently through the evolving Social Ecological Economics movement. See http://www.clivespash.org/

Abstract:

Discussions of the necessary action to combat human induced climate change have developed over forty years with increasing attention from the social sciences and particularly economics in the last decade or so. The resulting discourse has created some widely spread myths which have been employed at various stages to counter or undermine radical action. Some remain current in the policy debate and all have been deployed at some stage to counter mitigation. These include the following clams:

- climate change is an intergenerational issue,
- benefits of climate change will outweigh the costs,
- control is at the expense of the poorest,
- changing relative prices is the answer,
- markets and corporations are the best way forward,
- local action alone will do enough,
- new technology is needed,
- switching to a Green Economy will decouple emissions from growth,
- climate science is a religion,
- adaptation is the answer.

This paper will explain and critically explore each of the above myths. Their place in the climate change debate will be identified and the fallacious aspects of their underlying reasoning will be brought out. The aim is to identify the use of rhetorical arguments against radical greenhouse gas control and expose some aspects of the power games involved. The approach will be to understand where and why these arguments have been deployed and how they have been used in the policy debate. This should enable an informed

conclusion as to some of the key forces and mechanisms that confront those trying to achieve a radical change in emissions and why no substantive action has been forthcoming.

Prof. Dr. Jaap Spier, Supreme Court of the Netherlands

Presentation title: 'Legal strategies'

Conference session title: Policy options for radical mitigation

Biography:

Advocate-General in the Supreme Court of the Netherlands; honorary professor at the University Maastricht. Over the last ten years, I have been active in the realm of climate change. Have published extensively about this topic (e.g. *Shaping the Law for Global Crises*, Eleven Publishers 2012), delivered lectures at many places, participated in various international research projects. Founder and honorary president of the European Group on Tort Law.

Extended abstract:

"(...) the values of natural infrastructure, fairness, and safety have eroded over the years under a tide of market-based, neoliberal attitudes that have weakened the role of government and shielded it from accountability."[1]

It is very unlikely indeed that politicians will take action, let alone effective action, in time. So we must explore other strategies to come to grips with climate change. No doubt technical means and advance of science will play an important role to stem the tide. But it is open to debate whether technical measures (to the effect to reduce, store or remove GHG(-emissions)) will suffice. A shift of paradigm will be of utmost importance too. Leading newspapers and magazines focus ever more on the serious threats ahead of us. More likely than not: no single strategy will suffice.

There is an emerging debate about the role the law could play in relation to climate change.[2] Ever more lawyers focus on monetary damages *after* the event. I do not think that compensation is the most promising way ahead, if not for other reasons because it is unaffordable. But more importantly: it would mean that catastrophe would have to set in first before the law can come into play and that massive and global human suffering would have to materialize before the law could come into play. It would be extremely unsatisfactory if that would be the state the law. I don't think it is.

Conceptually, it is quite easy to paint the role the law could play.

Climate change is the most serious threat to humankind ever. That goes for the present and even more for future generations. It is common ground that posing others at avoidable risk is a violation of the law.[3] Even more so if the risk can be warded off at relatively modest costs. It follows from Stern's calculations[4] that the price of sticking to business as usual is significantly higher than the expenses that have to be incurred to reduce GHG-emissions and to take other preventive measures. A more efficient use of energy would already save quite some GHG-emissions.[5]

It follows from the precautionary principle, I think, that we must depart from credible worst case scenario's. Even a fairly remote chance that the 2 degrees Celsius threshold[6] would be passed, must be avoided.

If we combine both legal imperatives, quite a lot must be done. GHG-emissions have to be reduced at great pace and to a significant extent. We must start right now. This goes for States, enterprises and society at large. For a number of reasons the most vulnerable countries are not yet bound to reduce their GHG-emissions. Their part of the cake has to be assumed by the remainder of States and enterprises.[7]

In many legal systems courts can be called to aid in case of a threat of (serious) damage caused by unlawful actions by others. If States and enterprises don't meet their legal obligations, courts can issue injunctive relief, i.e. they can require defendants to meet their legal obligations.[8] True, this will not be a walk over. A series of potential obstacles, such as minimal contribution of most players, the "political argument" (this is an issue to be dealt with by politicians) and a few more have to be removed. Not all courts will show the courage needed, particularly so in our part of the world. But a growing number of courts understand that they must step in.[9]

A better understanding of the legal obligations of the respective players entails many more advantages:

* States and enterprises cannot argue (any longer) that they do not know what they must do;

* it strengthens the bargaining position of the vulnerable countries and the growing number of politicians willing to save the planet;

* it can be used by enterprises to explain to their shareholders that they must act;

* investors can urge "their" enterprises to meet their obligations;

* supervisory institutions could and should enter the scene. Climate change is, inter alia, about financial stability. They must secure that measures are taken to avoid a still avoidable economic collapse that will materialise if we stick to business as usual.

A mirage? I don't think so. But far from a walk over either. Climate change is a hydra that cannot be tamed easily. Lawyers cannot rescue the world, but together we can.

References:

1 Robert M. Verchick, Facing Catastrophe p. 4 and 5.
2 See, also for further references, my Shaping the Law for Global Crises and in Jaap Spier and Ulrich Magnus (eds.), Climate Change Remedies and Brian J. Preston, Climate change litigation, paper delivered to Climate Change Governance after Copenhagen, earlier published in The Judicial Review (2009) 203.
3 See for elaboration Shaping the Law for Global Crises p. 67 ff.
4 The Economics of Climate Change (2006).
5 See in more detail Fiona Kinniburgh, Compilation of International Authorities Supporting Specific Measures to Combat Climate Change, website of Center for Climate Change Law, Columbia Law School.
6 More or less abandoned by IPCC in 2013.
7 Seen from a legal angle, it is a challenge to determine the obligations of the respective players: what has to be done by whom. I cannot tackle that important topic in 10 minutes. A small group of eminent experts is working on this topic. We hope to publish our findings in the course of next year.
8 That is not necessarily true for all countries, of course.

9 See e.g. Brian Preston, Characteristics of successful environmental courts and tribunals, Presentation Eco Forum Global Annual Conference Guiyang 2013 and Richard Lord et al. (eds.), Climate change liability.

Dan Staniaszek, Buildings Performance Institute Europe (BPIE)

Presentation title: 'Required policy landscape to deliver radical emission reduction in the buildings sector'

Conference session title: Delivering radical mitigation 1 (via weblink)

Biography:

Dan heads up the Building Performance Institute Europe's data management, renovation and financing portfolios, building on a broad experience base across the sustainable energy space spanning 27 years, including 15 on senior the senior management teams of 5 organisations. In various advisory roles, he has influenced the design of EU Directives, including EPBD, EED, and the UK Energy White Paper, Renewables Obligation and Energy Efficiency Obligation scheme. He has given evidence to several Parliamentary committees, including on the Climate Change Bill. Dan holds Masters Degrees from the University of Oxford and London Southbank University, is a Chartered Engineer and a Member of the Energy Institute in the UK.

Abstract:

Existing policies to reduce energy usage and consequent greenhouse gas emissions from the EU building sector have done little more than stem the underlying growth in demand. Achieving significant, deep cuts needs a more radical approach, where the vision is a building stock producing more energy than it consumes. Such a vision can be achieved by building on the best examples of existing policies and applying them to residential and non-residential buildings alike:

Private owner occupied

- A **progressive bonus-malus mechanism** based on property EPC rating. Less efficient properties pay a penalty while the most efficient receive a rebate on their annual property tax (e.g. Council Tax in the UK). The progressive component relies on an escalator to raise the benchmark every 5 years, with significant penalties on inefficient properties to motivate action

Private rented

- Rules to **ban the rental of inefficient properties** from 2018 have already been proposed in the UK, though the level of ambition is far too modest. A more aggressive policy would raise the bar to the average efficiency of the building sector, and include an escalator to raise this every 5 years.

Public sector

- The current **3% renovation rate** for the central government estate, enshrined within the Energy Efficiency Directive, would be extended to all public buildings, including social housing.

New Build

- All new buildings across the EU should be energy positive from 2025

Professor Fred Steward, Policy Studies Institute, University of Westminster

Presentation title: 'Radical Efficiency' through city led system innovation for sociotechnical transitions'

Conference session title: Framing and barriers to radical mitigation

Biography:

Fred Steward is Professor of Innovation & Sustainability at the Policy Studies Institute, University of Westminster, London. A specialist on transformative innovation, sociotechnical networks, and sustainability transitions. President of the European Association for the Study of Science and Technology (EASST). He is policy advisor to a network of 6 European regions and the Making Transitions Happen platform of Climate-KIC, a key part of Horizon 2020. PhD in Science and Technology Policy, University of Manchester. Member of the programme committee of the Sustainable Transitions Research Network and of the Royal Society committee on Global Environmental Change.

Abstract:

The concept of 'radical efficiency' has been developed within the broad framework of system innovation within public services in response to novel challenges. (Gillinson, Horne & Baeck, **Radical Efficiency**, NESTA, 2010). It is suggested that this offers a different perspective on the approach to the contribution of end use energy efficiency to the challenge of mitigating climate change. Although efficiency is included in conventional modelling and scenario methods for green house gas emission reduction it tends to be regarded as continuous, modest, incremental contribution. (UK Government: **The Carbon Plan** – Delivering our Low Carbon Future 2011). Yet studies are increasingly recognising that in domains such as transport and household energy use there are prospects for very significant emission reduction through discontinuous, transformative innovation in energy efficiency (IEA **World Energy Outlook** 2012, Chapter 12)

This paper argues that the 'radical efficiency' pathway requires a new mode of innovation. The traditional technology driven business mode of innovation tends to privilege supply side energy technologies. End use efficiency needs a mode of innovation which is challenge led by place based public actors such as municipalities. They are responsible for real systems of housing and transport, and have no a priori stake in particular technological solutions (Steward F.(2012) Transformative innovation policy to meet the challenge of climate change **Technology Analysis & Strategic Management**)

Results are presented from EIT Climate-KIC's Pioneer Cities project involving Birmingham, Frankfurt, Bologna, Castellon. & Wroclaw, which is pursuing sociotechnical transitions in transport and housing to address such a radical efficiency perspective.

Provost Professor Richard Wilk, Indiana University

Presentation title: 'The power of shame: Using social pressure to reduce consumption'

Conference session title: Behaviours and engaging publics (via weblink)

Biography:

Richard Wilk is Provost Professor of anthropology at Indiana University, where he runs the Food Studies program. He has also taught at the University of California and New Mexico State, and has held visiting positions at University College London, Gothenburg University, the University of Marseille and Birkbeck College. His initial research on the cultural ecology of indigenous Mayan rainforest farming and family organization in Belize was followed by work on consumer culture and sustainable consumption, energy consumption, globalization, television, and food. Much of his recent work has turned towards the history of food, the linkages between tourism and sustainable development, and the origin of modern consumer culture. His publications include more than 150 papers and book chapters, a textbook in Economic Anthropology, two monographs and several edited volumes, His most recent books are Time, Consumption, and Everyday Life (with Elizabeth Shove and Frank Trentmann) and "Rice and Beans," (with Livia Barbosa).

Abstract:

How do we motivate the public to lower their consumption of energy, water and other goods, while reducing waste? How do we motivate public support for policies that raise the prices of certain kinds of goods, or increase disposal costs? Study after study finds that only a small number of consumers are willing to change their behavior for abstract environmental reasons, even when they believe a crisis exists. Even fewer people manage to lower their consumption or waste in a consistent way. Repeated study shows that changing community moral standards is the only effective way to restrain consumer behavior. Raising prices through taxation does not work well for inelastic-demand goods like energy, and there is always the danger of a "Veblen effect" where higher prices confer high status, and actually increase consumption. This paper proposes several strategies for using the power of public shaming to stigmatize high consumption levels. Drawing on examples from water-use reduction campaigns and energy billing strategies in the USA, the paper argues for a focus on those consuming more than two standard deviations above the mean, and on particularly dramatic wasteful practices, among both households and industries.

Rebecca Willis, Green Alliance

Presentation title: 'The 'penny-drop moment': Building political leadership for radical emission reduction'

Conference session title: Governance for radical mitigation

Biography:

Rebecca Willis is an independent researcher. Her work focuses on environmental politics and policymaking at both a national and local level. Rebecca convenes Green Alliance's Climate Leadership Programme for MPs, and advises the Lake District National Park on climate change. She is a Council Member of the Natural Environment Research Council, and advises the new ESRC and EPSRC-funded DEMAND centre (www.demand.ac.uk), a multidisciplinary centre addressing end-use energy demand. From 2004-11 Rebecca was Vice-Chair of the UK Sustainable Development Commission, working with government ministers, advisers and officials to ensure that government policy reflects sustainability goals. Her freelance portfolio has included work for the Universities of Cranfield, Leeds and Lancaster; national government departments Defra and DECC; Airvolution Energy; and Co-operatives UK.

Extended abstract:

Crossword fanatics call it the 'penny-drop moment', or PDM: the moment when a series of jumbled clues falls into place, and the whole picture becomes clear. I've seen it happen. At the end of a long question-and-answer session between new MPs and a climate scientist, something clicks. The politicians realise that the development of modern societies, economies, and arguably democracy itself, has only been possible because of a stable climate – and that we can't take the climate for granted any more. There's a tangible change of mood as this reality sinks in, and the MPs grasp the significance of climate change for the future of politics, and, indeed, their own political careers.

I saw the 'penny drop moment' for myself during several workshops for new MPs run by Green Alliance, as part of its Climate Leadership Programme. Since 2009, Green Alliance has worked with over 60 prospective and existing Members of Parliament, to develop MPs' understanding of climate change and what it means for them. The programme combines dialogue between politicians, scientists and policy experts, with a process of experiential learning in MPs' constituencies.

Green Alliance's work aims to take politicians to the 'penny drop moment' and beyond, consolidating their scientific understanding of the issue and working with them to think through what climate change means for their role as local leaders and national representatives.

This presentation explores some lessons learned from Green Alliance's programme, and ask how best to build political leadership for climate change. Lessons include:

The personal is political. Politicians' outlooks are shaped by their education, work and personal circumstances. If climate change has not figured as a salient issue in their lived experience, it is harder for them to engage with the issue emotionally or intellectually. The Climate Leadership Programme works with MPs in their constituency, and puts them in contact with people who are affected by, and understand, the issues.

Political philosophies have been blind to climate change. The two major political traditions in the UK do not yet have a sense of how climate change alters political outlooks and assumptions. For conservatives, a focus on free markets and personal responsibility sits awkwardly with climate politics, which requires a long-term, collectivist response. On the Left, the focus has been on social equity and fairness, and environmental concern can be viewed with suspicion, as a 'luxury' to be worried about only once basic needs are met. Green Alliance has been working with political thinkers in all major parties, to explore with them what climate means for political philosophies and outlooks.

Ask not what we can do for the environment… To the extent that political traditions have taken environmental considerations on board, the language has tended to be that of 'protecting the environment' or 'preserving nature': an appeal to altruism. Climate change turns this on its head. We can no longer assume a broadly benign natural environment as a backdrop to politics. Instead, maintaining a stable climate must become a central focus of politics itself. In other words, ask not what we can do for the environment, but what the environment can do for us.

It's not just a job for the specialists. Each party has a knowledgeable group of climate and energy specialists, who work hard to raise the profile of these issues. However, radical emission reduction is not just about energy policy. It is about land use, transport, agriculture, taxes, social inclusion, education and international development. So political leadership has to come from a much broader base – in other words, from those who don't see themselves as environmental specialists. Green Alliance supports the specialists, of course, but works hard with all MPs to draw out the implications for their own personal areas of expertise.

To lead or to follow? Particularly in times of austerity, climate change may not be perceived by the electorate to be to be a central political concern, and so politicians may be wary of championing an issue that does not seem to have their constituents' support. However, the relationship between a politicians and their constituents, and indeed between a political party and its supporters, is complex. It is not about leading or following, but about creating the political space for discussion. There is a need to work with political leaders to create the conditions for the cultural and behavioural shifts that we need.

From blueprint to action: Much work has been done on mapping potential emissions reduction pathways, and developing a blueprint of the technical and economic resources required to shift to a low-carbon future. These visions cannot be realised unless we get the politics right. Radical policies require political leadership, and politicians need support to manage such a complex transition. The 'penny drop moment' is only the beginning.

Professor John Wiseman, Melbourne Sustainable Society Institute, University of Melbourne

Presentation title (1): 'Winning the climate war: Removing political roadblocks to radical emissions reductions'

Conference session title: Framing and barriers to radical mitigation (via weblink)

Biography:

Professor John Wiseman is Deputy Director of the Melbourne Sustainable Society Institute, University of Melbourne. John has worked in a wide range of public sector, academic and community sector settings including as Foundation Director of the McCaughey Centre, School of Population Health, University of Melbourne; Professor of Public Policy, Victoria University; and Assistant Director, Policy Development and Research, Victorian Department of Premier and Cabinet. The major focus of his current work is on the social and political transformations needed to prevent runaway climate change and achieve a rapid transition to a just and resilient post carbon future.

Extended abstract:

As the probability and risks of runaway climate change continue to grow, so too does the urgency of a swift transition to a just and resilient post-carbon future. The Post Carbon Pathways project <www.postcarbonpathways.net.au> aims to help meet this challenge by strengthening understanding of i) key elements of the most promising and innovative large-scale de-carbonisation strategies; and ii) the most effective ways of overcoming barriers to the rapid implementation of these strategies.

The first phase of this project involved a critical overview of 18 of the most ambitious large-scale post-carbon economy transition strategies, from both government and non-government sources. The second phase, informed by interviews with leading policy makers and researchers working in this field focused on learning about challenges involved in the swift implementation of post-carbon economy transition strategies. This paper provides a summary of the following core findings from this project.

1. The probability and risks of global warming of four degrees or more are rapidly increasing. This is, however, an argument for visionary leadership and decisive action - not political paralysis and buck-passing.

"We are running out of both time and options because we are not being honest about what has to be done. The solutions exist, but unless you are honest about the problem, they will never be adopted."

Ian Dunlop, Club of Rome and Safe Climate Australia

2. The technological and economic roadmaps to avoid catastrophic global warming are now widely understood: rapid replacement of fossil fuels by renewable energy; rapid reductions in energy consumption and improvements in energy efficiency; and the drawdown and sequestration of carbon into sustainable carbon sinks.

"Meeting 100 per cent of global energy demands through renewable energy is technically and economically feasible. The main problems are political and social."

Professor Mark Jacobson, Director of Atmosphere and Energy, Stanford University

"The only way to avoid the pessimistic scenarios will be radical transformations in the way the global economy currently functions: rapid uptake of renewable energy, sharp falls in fossil fuel use or massive deployment of Carbon Capture and Storage, removal of industrial emissions and halting deforestation. This suggests a need for much more ambition and urgency on climate policy, at both the national and international level. Either way, business-as-usual is not an option."

PriceWaterhouseCoopers UK, 'Too Late for Two Degrees'

3. The biggest barriers to a swift transition to a post carbon future are political not technological.

"The biggest barriers to solving the climate crisis are the vested interests of big oil and big coal and the influence they have."

Lester Brown, Director, Earth Policy Institute,

"Breaking the power of the fossil fuel industry is going to be the real key. Once they're not blocking every change, I suspect we'll see interesting and unexpected change."

Bill McKibben 350.org

4. The priority actions needed to remove the political roadblocks preventing the rapid implementation of these policies are increasingly clear.

- Deepening understanding of the required speed of emissions reductions
- Overcoming the power and influence of the fossil fuel industry and its allies
- Overcoming political paralysis and strengthening the determination of communities, governments and businesses to take decisive action
- Fostering creativity and disruptive innovation in diverse, interconnected systems including renewable energy, energy efficiency, urban design and food water security
- Developing an economic paradigm focused more on broadening wellbeing and resilience than on further expanding the conspicuous consumption lifestyles of the powerful few.
- Strengthening financial and governance institutions and capabilities needed to drive swift implementation of large-scale de-carbonisation strategies.

In the end however the most challenging question remains: How might the transition to just and resilient post carbon future actually occur? What theory of social and political change could plausibly deliver emissions reductions at sufficient speed and scale? Responses to this question point to three overlapping and interrelated transformation pathways.

1. An unwaveringly honest, carefully targeted education and communication strategy strengthening the scientific, economic and ethical case for decisive climate action

"Providing good information about the reality of climate change is an essential but insufficient piece of the communication and education effort. Many of the groups we are focusing on already know it's a problem. What they need to be armed with is how to win the conversation; how to make the case to their neighbours, to their friends, to their grandparents, to their grumpy uncle who talks about sunspots at Thanksgiving dinner. Then it's really about trying to connect people with each other. So they draw their strength from each other, get a sense of a community and really arm themselves with the belief that they can change the conversation. Because at the end of the day, what we're really talking about is building a movement."

Kevin Curtis, Former Chief Program and Advocacy Officer, Climate Reality Project, Washington DC

2. Game changing technological and social disruptive innovation

"Public will, individual psychology, and technological innovation come together to create tremendous innovation dynamics, tremendous substitution dynamics. In a few years renewable energy has already overtaken, at least in installed capacity, the nuclear power industry in Germany. So this is 'proof of concept - that yes we can create big transitions."

Professor John Schellnhuber, Director, Potsdam Institute for Climate Impacts

"There's a magical point in markets where they all suddenly tip. They're looking for 'Where's the opportunity for growth and discovery and opportunity?' There's a point coming in energy like that. China ramps up its response and the US starts to panic. Once the money is saying,

‘Hello -- we can do this!’ then the policy will take off. Then that will become self-fulfilling -- the collapse of the coal and oil industry….”

Paul Gilding, Author of ‘The Great Disruption’

3. Decisive leadership and community mobilization – particularly at moments of climatic, political and economic crisis

“In 2006 the timing was right for passing the Californian Clear Air Act. People understood the science, we had the right mix of politicians, we had a governor who was very energetic on the issue and all these things coalesced. You never know when that’s going to happen - and that’s where leadership really comes in.”

James Goldstene, former CEO, California Air Resource Board

“The trigger is going to be some sort of natural disaster that wakes people up. We’re already seeing that happening, in that we’re probably locked into irreversible change in the Arctic with the disappearance of the sea-ice. The community will wake up to what is occurring and demand action, along the lines that: ‘We have been looking at the problem for 30 years and done virtually nothing. Now we have to really start moving’. The pressure will then come on the business and political worlds for real action.”

Ian Dunlop, Club of Rome and Safe Climate Australia

“We’re really on the edge of some fundamental changes. I liken it to recognising the link between smoking and health 20 years ago and the tobacco company CEOs are under oath saying, ‘There’s no proof of a link between smoking and health,’ and get away with it. Then, within a year or two, everything had changed and they couldn't say anything because no one would listen to them and no elected member of Congress would be seen in public with a tobacco company CEO. It just changed that fast. It happened very quickly, it had reached the tipping point and suddenly it was an entirely new ball game.”

Lester Brown, CEO, Earth Policy Institute

Presentation title (2): ‘Out of the shadows: Moving climate decision makers from private concern to public action’

Authors: Lauren Rickards and John Wiseman

Conference session title: Governance for radical mitigation (via weblink)

Biography:

Dr. Lauren Rickards is a Research Fellow at the Melbourne Sustainable Society Institute, University of Melbourne. A human geographer by training, Lauren conducts critical research on the cultural aspects of climate change. A Rhodes Scholar, she received a M.Sc. and D.Phil. from the University of Oxford, where she is now a Visiting Research Associate. Before joining academia she worked for RMCG, a private consultancy firm, consulting primarily to state and federal Australian government and the rural sector.

Extended abstract:

Between the idea and the reality;
Between the motion and the act
Falls the Shadow

Between the conception and the creation;

Between the emotion and the response
Falls the Shadow
T.S. Eliot, The Hollow Men

Sufficient climate action requires that senior political, policy and business decision makers use their professional influence to strongly prioritise emissions reductions in their strategic decisions. While many of this powerful but under-researched group purportedly recognise the need for change, and incremental action is increasingly common across a range of organizations and institutions, radical cuts at the required speed and scale remain elusive.

Why this might be the case is the focus of this exploratory paper. In a comprehensive but necessarily subjective way, it brings together a large and fragmented literature from a wide variety of disciplines and theoretical perspectives to summarise the many potential inhibitors that appear to be at work among at least some senior decision makers in bureaucratic and corporate institutional contexts.

The fields of study examined include psychology, ethics, critical sociology, organizational studies, economics, business management, transition management, sustainability studies, decision-making, public policy and administration, and the emerging specific literature on climate change decision making. Taking a cross-disciplinary, cross-sectoral and cross-scale approach oriented towards critical organizational studies, the paper bridges the ongoing research divide between agency- and structure-oriented perspectives of change, as well as realist and constructivist traditions. The result is the identification of potential psychological, ethical, social, cultural, discursive, practical, political, financial and economic barriers to major change at the individual, organisational, institutional and external levels.

Individual-level or personal factors that may inhibit senior decision makers taking strong action on climate change include a business-based education, a low perception of climate change risk, low sensitivity to environmental change, an ambitious attitude to work and career, high sensitivity to professional risks, low engagement with the ethical issues posed by climate change, a masculinist professional identity, conservative political affiliations and a strong social relations with similarly-minded people.

Organisational level factors include the strength of existing organisational goals, models, and processes, a lack of climate change capabilities, the structural marginalisation of climate change as an optional Corporate Social Responsibility issue, use of in-house scientists, and perceived inaction by colleagues and similar organisations.

Institutional or cross-organisational level factors include the framing of climate change in normal risk management terms and the hegemony of mainstream economics, market-based carbon governance mechanisms, and the shareholder value and managerialism ideals. “External” factors are numerous and include (perceived) financial and economic constraints policy uncertainty, climate change misinformation, a conservative national political context, a lack of substantial stakeholder pressure, and the pragmatism of much contemporary, relevance-oriented academic research.

The paper concludes by arguing that in general the barriers faced by senior decision makers can be summarised as the interrelated factors of willingness and perceived capacity to act. The latter is shaped by – and shapes - all of the ‘structural’ or higher level factors. Three useful points can be made about these. First, a process-based perspective of organizations and institutions as processes of ‘organizing’ and ‘institutionalizing’ emphasises that such structures are being constantly being made and remade by the decisions and actions of those within them, particularly those with the capacity to alter how things are done such as top management. Awareness of the accumulative effect of what Stokes and Harris (2012) call ‘micro-moments’ in the work place highlights the choices and possibilities for change that exist within everyday work settings beginning, for example, with personal reflection and

questioning about the way things are done and to what effect. Symbolic actions on a small or large scale can help to stimulate such questioning.

A second related point is that a lot of what is taken as structural emerges out of collective performance and resultant perceived peer norms and peer pressure. The power of such social relations (even if antagonistic) suggests that transformational shifts can emerge if the perceived social pressure shifts in direction from one unfavourable to radical emissions reductions to one favourable. Work on 'institutional entrepreneurs' suggests that key individuals or groups of individuals can trigger such shifts.

The third point is that for sustainable change to occur it needs to be embedded as an ongoing process in new organizational modes, regulations and institutions. It also needs to be supported by an integrated array of efforts from the individual to external levels. The latter highlights the role of critical research in helping to problematise the status quo and construct new discursive resources for individuals and resources to frame the problem in actionable ways.

To end, it is important to acknowledge the limitations of this preliminary research. In tackling such a large and multifaceted question, we are very conscious of the risks of papering over variation within and between senior government and business decision makers, including in the ways in which they are tackling climate change. Despite the challenges of research elites, empirical work is badly needed to further explore the ways in which the various suggested factors play out in different contexts and situations. Second, listing a large number of factors and dividing them between levels leaves open the question of how they inter-relate and what is of most important in what setting. Third, a question such as the one of this paper poses the challenge of not appearing to overly individualise the problem and displace responsibility and blame onto senior decision makers. We are also keen to avoid any sense that by identifying a large number of barriers to action we are providing an 'excuse' for climate change inaction by senior decision makers. Bearing in mind these caveats we hope that this research helps to conceptualise the crucial question of the reasons why many senior decision makers continue to only engage support incremental rather than transformational progress in achieving radical emissions reductions.

Abstracts: poster presentations

Dr. Nick Bardsley, School of Agriculture, Policy and Development, University of Reading

Poster title: A comprehensive “policy package” for global emissions reduction

Authors: Nick Bardsley and Brian Davey

Biography:

Dr Bardsley is a behavioural and ecological economist, currently employed as lecturer in climate change economics at the University of Reading, School of Agriculture, Policy and Development. His research interests are in climate change and energy policy, and alternatives to conventional economic theories of behaviour. His recent work has focussed on UK household CO_2 emissions, using both experimental methods and secondary data analysis. He has recently contributed to “Sharing for Survival” (Feasta books, 2012) on climate change policy packages, and to the journal Critical Social Policy, and the forthcoming Handbook on Social Policy and the Environment (Edward Elgar), on household CO_2 emissions. He is a research associate of the Walker Institute for Climate System Research and a member of the Foundation for the Economics of Sustainability (Feasta). Presentations were recently given by Dr Bardsley at the Royal Statistical Society and the Department of Energy and Climate Change. Dr Bardsley has a B.A. (Jt Hons) in Economics and Philosophy (Leeds) and a PhD in Economics (UEA).

Abstract:

The paper explores the possibility of degrowth in the global North to radically reduce emissions while being different from simple austerity, and proposes an alternative to “carbon development” in the South. In “over-developed countries” national policy packages will drive decarbonisation and contraction, together with policies to provide sufficient taxes to pay for structural transformation and to ensure stable employment. Site value taxation will provide a stable source of revenue and enhance localisation. Banking system reform will end the growth imperative stemming from money based on interest-bearing debt and finance investments in efficiency and renewables. It means employment and training programmes to develop the new skills necessary in a declining emissions economy. It means banning fossil fuels sales without a permit, capping the number of permits and quickly reducing them to drive degrowth and decarbonisation. The permit revenue should be shared in various ways, to gain public support and resources for change at household level. Well being is increased by achieving goals other than buying and owning material possessions – for example greater equality; more free time; ability to live out non materialistic values; more opportunities for sharing and “communing.” Strategies to promote these should also be pursued at the local level. In the South 2 billion people who live as ‘communities of people in communities of species’ (commons managed with customary rights in carbon rich bio-diverse eco systems) should be protected from land enclosures and supported in their endogenously-developed “life projects” within the capacity of their local eco-systems.

Pete Brace, Tinkers Bubble (Fossil fuel free community)

Poster title: Climate change: How and why YOU need to change

Biography:

After completing a degree in Computer Science and a successful 7 year career in video games, I realised that I needed to make radical changes to my life, given the threats posed by Climate Change and Peak Oil. After nine months of volunteering on farms, using my bicycle as transport, I settled at Tinkers Bubble, a low impact community, where use of fossil fuels is prohibited. Over my 3½ years here, I have drastically reduced my emissions and continue striving to attain zero emissions; whilst maintaining a high quality of life.

Abstract:

We need to make radical changes to prevent catastrophic climate change. It is unrealistic to expect the government to bring them about; even if they had the inclination, the majority of the media, and therefore the public, would not stand for it.

However, there is nothing to stop us making these changes ourselves. Indeed, I argue that grassroots change is the only solution. Whilst many people argue that the rate of decline required to give a chance of preventing catastrophe is impossible, I achieved 90% emissions decline in a couple of years.

In this talk I will show the simple changes that are required of everyone; and how this can actually lead to widespread change.

In short, we need to stop just talking about change and waiting to be told to make it.

Dr. Peter Carter, Climate Emergency Institute

Poster title: How deep and how fast must emissions be reduced?

Biography:

Peter D. Carter, MD, is a retired family doctor and a founding director of the Canadian Association of Physicians for the Environment (CAPE). His past experience is in environmental health protection policy development. Since 1988, Peter has been following the global warming and climate change research and synthesizing it for public audiences. His work now, on environmental health for the Climate Emergency Institute, is to explain the risk and the magnitude of the global climate change emergency as it affects the most vulnerable regions. His focus is committed climate change- a unique most policy relevant simple summation of our 'practically unavoidable global warming'. He correlates this with human population health effects- particularly food security. Over the past two years he has presented this to several international climate change conferences – including Canada, US, South East Asia (Philippines), European Geophysical Union (Vienna) and the Potsdam Climate impacts Conference.

Abstract:

How deep? Global temperature (and ocean acidification) can only stabilize long term with zero carbon emissions (IPCC AR4, 2007). This means a total conversion of all fossil fuel energy to clean, zero-carbon energy sources and avoidance of carbon feedback emissions. The IPCC RCP scenarios do not offer a scenario for the conversion of a fossil fuel-driven economy to a zero-carbon economy (RCP 2.6 is 55% fossil fuel and 5% clean, zero-carbon energy); carbon feedback emissions are absent from the IPCC RCPs. The only reliable way to reverse global carbon emissions towards zero is through government correction of the greatest market failure ever (Stern Commission, 2006): by stopping fossil fuel subsidies ($1.9 trillion annually IMF) and charging polluters the full costs of GHG pollution. This step depends on governments being advised of our planetary emergency situation (Hansen, 2008). How urgently? 2ºC is disastrous (Hansen, 2008) and catastrophic – at least to huge human populations (IPCC, 2007). By IPCC AR4 stabilization calculations, we are committed to a warming of 2.4-4ºC. By a simple summation, this paper shows that total committed warming is above 3ºC by 2100. World energy plans commit us to 5.5ºC by 2100 (Betts, 2011). Duration and rate of warming do matter. They determine the amount of carbon feedback emissions and resilience of ecosystems and food production systems . We show that 2ºC means a large reduction of world food productivity and declines affecting even the best food-producing regions, and an extreme risk of Arctic feedback runaway climate change.

Kim Coetzee, Energy Research Centre, University of Cape Town

Authors: Anya Sofie Boyd and Kim Coetzee

Poster title: The development-first approach to radical climate action

Biography:

ANYA SOFIE BOYD is a Senior Researcher in the Energy, Environment and Climate Change group at the Energy Research Centre (ERC) at the University of Cape Town – and is currently particularly involved in the Mitigation Action Plans and Scenario Programme (MAPS). Her research focuses on low carbon development actions and policies, Nationally Appropriate Mitigation Actions (NAMA's), MRV and technology negotiations under the UNFCCC. With a background in design engineering, she is continually interested in the interaction between policy and concrete action. Anya joined ERC in 2008, and after completing the MSc programme in Energy & Development studies at the Energy Research Centre is now a full time researcher. Prior to joining the ERC she worked in the fields of energy, water and waste efficiency; and the application of technologies to improve the livelihoods of poor communities. Anya holds an MSc in Energy and Development Studies and a Masters in Structural Engineering with Architecture.

KIM COETZEE is a PhD researcher in the field of Global Environmental Governance; particularly as related to climate change and developing countries. Her specific areas of interest include the overlap between the trade and climate change regimes, low carbon development strategies, and the role of alternative ideational constructs in the governance of climate change. She has a Masters' degree in international relations from the University of Cape Town and is currently a MAPS Programme researcher.

Abstract:

It has been common cause in the international climate change regime that setting ambitious GHG reduction targets was sufficient to remain below a 2 degree centigrade temperature increase. Progress continues in quantifying & estimating potential GHG emissions, however, has not yet translated into a radical reduction in emissions. Given the drastic implications of the current global emissions trajectory, we set out to analyse the how addressing the issue of implementation at a practical, national level would move countries from text-based ambition to real action. The paper leverages the on-going experiences under the MAPS programme, which is a unique platform that aims to support countries to generate their own evidence base for radical emissions reductions whilst simultaneously building a legitimate process. MAPS is a South-South collaboration across developing counties, and this paper shares lessons from current in-country processes and collaborations in Latin America and Africa. The findings are based on action research in collaboration with in-country research teams involved in their current national planning processes.

We found that beyond financial and technical support, the approach to achieving ambitious action requires climate change mitigation actions to foremost be aligned with national development priorities. Furthermore, considering issues of implementation early on in the design process – such as understanding social acceptance and vested interests within government structures and stakeholders, are key.

This has led to an increasing focus on the need for transitional actions that prioritise development whilst simultaneously ensuring that climate-needs are non-marginal, and embedded in broader socio-economic conditions.

Daisong Liu, Fudan University

Poster title: Carbon emission behaviour of shanghai middle class

Biography:

Daisong Liu is now a doctor candidate majoring in Population, Resources and Environmental Economics in Fudan University instructed by Prof. Ren Yuan. He got his degree of bachelor of medicine majoring in Public Health at Fudan University from 2002 to 2007 and his master's degree in Fudan University majoring in Communication from 2007 to 2010. Since 2010, he is a deputy secretary of the CYL of Fudan University.

Abstract:

There are three key stimulating factors stimulate the global carbon emission rising: population growth, consumption increase and the carbon-intensive production. It has been a long time that the solution of Chinese carbon emissions was mainly focuses on the production area since the industrial structure is comparatively falling behind. However with the adjust ion of industrial structure which some developed regions have taken lead into the level of developed country's industrial structure, the middle class is now growing like a weed in China. Therefore owning to the life style change and the level of life is rising of middle class, the pattern of distribution of overall carbon emissions has already been altering. And these change make the carbon emission in consumption model is sharply increasing. Also it will be the significant place in Chinese Carbon emission in the future.

This study try to focus on the Carbon emission behaviour of Shanghai middle class, to analyse the behaviour of family energy consumption, trace the features of consumption behavior, and find out the behavior elements of high-Carbon emission group, to give an

effective measure to change the high-Carbon emission behavior, improving the behavior of energy consumption is decreasing.

A/Prof. Dr. Mark Diesendorf, Institute of Environmental Studies, University of New South Wales

Poster title: There are no major *technological* barriers to phasing out fossil fuels rapidly

Biography:

BSc (Hons 1) in physics, PhD in applied mathematics. Deputy Director, Institute of Environmental Studies, University of New South Wales, Sydney. Previous appointments include: Principal Research Scientist, Commonwealth Scientific and Industrial Research Organisation; Professor of Environmental Science and Founding Director, Institute for Sustainable Futures, University of Technology Sydney; Director, Sustainability Centre Pty Ltd. Over 100 peer-reviewed publications. Recent books include 'Human Ecology, Human Economy: Ideas for an ecologically sustainable future' (co-edited; Allen & Unwin); 'Greenhouse Solutions with Sustainable Energy' (UNSW Press); 'Climate Action: A campaign manual for greenhouse solutions' (UNSW Press); 'Sustainable Energy Solutions for Climate Change' (in preparation for Routledge-Earthscan). His main interdisciplinary fields of interest are sustainable energy (technology assessment and policy), urban transport, theory of sustainability, and practical processes by which government, business and other organisations can achieve ecologically sustainable and socially just development, globally, nationally and regionally.

Abstract:

To clear the way for the conference's examination of the *non-technological* barriers to the rapid phase-out of fossil fuels, this paper critiques the alleged major technological/economic/resource barriers to renewable electricity (RElec), a major part of the technological solution for the heat and transport sectors as well as electricity. The alleged barriers are: 'too diffuse, intermittent, unreliable, immature and expensive to run an industrial society'.

'Too diffuse' is refuted by the tiny land area required to power the whole world with solar. However, like fossil fuels, RElec resources are distributed inequitably, so trade via new transmission lines is required.

'Intermittent, unreliable and immature' are refuted by hourly computer simulations of electricity supply and demand in many regions with 80-100% RElec supplied by commercially available technologies. The myth, that baseload RElec is needed, is refuted.

Mass-manufactured RElec and energy efficiency technologies can be grown much more rapidly than nuclear power or coal power with carbon capture and storage.

Using conservative government cost projections, our hourly computer simulations find 100% RElec is economically competitive with a hypothetical 'efficient' fossil fuelled system in Australia in 2030 either with a carbon price of AUD 50-65/tonne CO2 or by transferring existing Australian fossil fuel subsidies to RElec.

100% RElec is technologically feasible and affordable. The current technological gap in the energy sector, that cannot be bridged by electricity, is large-scale production of renewable fuels for aviation and rural road transport – rail and biofuels are alternatives. However, the principal barriers to rapid climate mitigation are not technological.

David Ellison, Institute of World Economics

Poster title: On the potential role of forests in emission reduction scenarios

Authors: David Ellison, Hans Petersson and Mattias Lundblad

Biography:

DAVID ELLISON is Senior Researcher at the Institute of World Economics, Hungarian Academy of Sciences (Budapest, Hungary). His work focuses broadly on the science, policy and politics of climate. He has published broadly on European and International climate change mitigation and adaptation strategies. He is currently involved in a multi-year Swedish research project, Future Forests, and works closely together with Swedish colleagues at the University of Agricultural Sciences (Umea and Uppsala, Sweden).

HANS PETERSSON and MATTIAS LUNDBLAD both work at the Swedish University of Agricultural Sciences (SLU), in Umea and Uppsala (respectively) and have been involved in building up the Swedish national GHG reporting system. Mattias is directly involved in providing projections to the Swedish government for the potential to fulfill Swedish EU and UNFCCC level emission reduction commitments. He is further currently engaged in UNFCCC/Kyoto LULUCF negotiations. Hans is an expert in the Swedish National Forest Inventory of living biomass, deadwood and land use changes, and has been invited to act as an expert to the IPCC. Both Mattias and Hans have participated in many LULUCF-related projects and publications funded separately by the Swedish government and also the Nordic Council of Ministers.

Abstract:

The neglect of forests in current accounts of potential emission reduction pathways is a serious omission. Though current accounts suggest forests cannot play an important role (UNEP 2012, IEA 2013), the opposite is true. Moreover the failure to incorporate the potential role of forests into current strategy building may substantially reduce the positive impact they could have. We demonstrate that forests can play an important role both in sequestering carbon and potentially also in the pursuit of "*negative emissions*". While most associate negative emissions with carbon capture and storage (CCS, see e.g. Milne and Field 2012), we argue instead that negative emissions can best be achieved by combining the pursuit of current emission reduction pathways with an additional focus on carbon sequestration in standing forests (and possibly harvested wood products, HWP). A good example is provided by the case of Sweden, though the potential to pursue such strategies is by no means limited to this country. A recent Swedish EPA (2012) roadmap, for example, projected the potential achievement of zero emissions by approximately 2050. However, when we considered the additional contribution of standing forests and HWP, we found that Sweden could potentially cross the zero emission target and enter into negative emission territory as early as 2029, possibly earlier under a more supportive policy framework (Ellison et al 2013). We elucidate this model data on Sweden and one or two additional countries. In

addition, we enumerate appropriate strategies for raising the potential forest contribution in Sweden and other countries.

Dr. John Foran, University of California, Santa Barbara, and International Institute of Climate Action and Theory

Poster title: A tale of three COPs: The global climate justice movement scales up, 2011-13

Biography:

I am professor of Sociology and Environmental Studies at the University of California, Santa Barbara. My scholarship and teaching have focussed on radical social movements, and my books include the award-winning *Taking Power: On the Origins of Revolutions in the Third World* (Cambridge University Press, 2005) and *Taking Power versus Re-Making Power: Movements for Radical Social Change and Global Justice* (under contract with Zed Press). Since 2009, my research has increasingly focused on the politics and social movements of climate justice, and I am engaged in a global ethnography of the movement, gathering data both for a book, *The Climate Activists: A Global Ethnography,* and a film project, *Not Yet the End of the World*, both with my research collaborator, Dr Richard Widick. Together, we are Co-Directors of the International Institute of Climate Action and Theory, with a website at www.iicat.org, where our publications on climate issues and trailers for our fim project can be found. My academic website can be found at www.soc.ucsb.edu/faculty/john-foran

Abstract:

This presentation considers the rise of a global climate justice movement since Copenhagen at COP 15 in 2009. The trajectory of the movement, its growth, particularly among youth and in the global south, will be presented, and the strategies, visions, and organizational forms of the movement will be assessed.

Data will be drawn from audio- and video-taped interviews gathered at three successive COPs: COP 17 in Durban in 2011, 18 in Doha in 2012, and 19 in Warsaw in 2013, and from the websites, newsletters, and publications of a variety of organizations and movements attending the UN climate summits, including Climate Justice Now!, 350.org, Friends of the Earth International, the Third World Network, Climate Action Network, and Greenpeace, with special attention on youth delegations such as the UK Youth Climate Coalition, the Canadian Youth Delegation, the Arab Youth Climate Movement, Earth in Brackets, SustainUS, Negotiator Trackers, and others from Australia, New Zealand, Bangladesh, Maldives, Ecuador, and elsewhere.

The paper aims to evaluate the accomplishments and limitations of the movement(s) to date, and identify best practices and suggest ideas for its rapid growth in the two years leading up to the COP 21 in Paris. The hypothesis behind the study is that only and strong and vigorous climate justice movement on a global scale has the capacity to force governments to stand up to the economic and political forces of carbon capitalism to agree to the treaty needed to keep the planet under the vanish critical threshold of two degrees Celsius.

Dr. Kennedy Graham, Green Party Member of Parliament (New Zealand)

Poster title: Radical emissions reductions: New Zealand

Biography:

Kennedy Graham is a New Zealand Member of Parliament, elected 2008, re-elected 2011. He is a member of the Green Party, and ranked 5th among the Greens' 14 MPs in the 50th Parliament. His main portfolio is Global Affairs (involving foreign policy) and in addition he is spokesperson for climate change and (as associate) sustainable economics. Dr Graham is also Senior Adjunct Fellow at the University of Canterbury (School of Law), and the Director of the New Zealand Centre for Global Studies. In 2006-9, he was Visiting Professor in International Relations at the College of Europe, in Bruges. Dr Graham holds a B. Com (Auckland), MA in International Relations (Fletcher School of Law & Diplomacy, Boston), and a Ph.D. (Victoria University, Wellington). He has received Fulbright and Fletcher scholarships, a McCarthy Fellowship (1986), and was a Fellow at Emmanuel College, University of Cambridge, England, as well as Research Scholar at Bellagio Centre, Italy (1995). Dr Graham served in the NZ foreign service for 16 years, specializing in global security and the UN, his last diplomatic assignment being counsellor in the NZ Mission to the United Nations in Geneva. He has lived and worked in nine countries in Asia, the Pacific, Europe, the Middle East and the Americas. From 1999 to 2004 he worked for the United Nations University, first as Director of its Leadership Academy (Amman, Jordan; 1999-2002); then as director of its Regional Security & Global Governance Project (Bruges, Belgium; 2002-4). In 2004 he was commissioned to provide a paper for the UN Secretary-General's High-Level Paper on Threats, Challenges and Change, and in 2006 for a paper on Human Security in the Pacific for UNDP. In 2005-6 he has been Senior Consultant to the UN's Dept. of Political Affairs in New York, assisting in the preparation and convening of the Secretary-General's high-level meetings, and the Security Council's meetings, with regional organizations. He entered Parliament in December 2008.

Abstract:

With large-scale impacts of climate change becoming discernible from the background of natural variability, concern is rising over the global community's failure to control emissions. Today in 2013, we face an unavoidably radical future. We either continue with rising emissions and reap the radical repercussions of severe climate change, or we acknowledge that we have a choice and pursue radical emission reductions.

Among the Annex I States Parties to the UNFCCC's Kyoto Protocol, New Zealand has one of the worst track records in mitigation. Although it has constructed the world's second emissions trading system (after the EU), it has maintained such weak settings that emissions have risen, unperturbed. It has turned away from a second legally-binding commitment period under Kyoto. And it has been slow in entering a formal pledge for a 2020 target.

This Paper will explore the governance opportunities, and the hurdles faced, in fostering non-marginal mitigation in New Zealand. It will explore the employment and economic impacts and opportunities of radical reductions in GHG emissions.

The paper follows a logical thread:

- It first assesses the magnitude of the global challenge of mitigation, and the inadequacy of the international community's response to date (between the 1992 Framework Convention and the end of the Kyoto I period in 2012).

- It then recalls the decision of the 17th UNFCCC-COP that the international community should confine emissions to levels that will not result in a global temperature rise of more than 2°C.
- It reviews the recommendations of UNEP pertaining to reductions in global emissions required to stay within that threshold, by 2020, 2030 and 2050.
- It reviews the recommendations of IPCC pertaining to the percentage targets required of Annex I states to make a fair contribution to the global reductions based on the CBDR principle – for 2020, 2030 and 2050.
- It applies those percentage targets to a National Responsibility Target for New Zealand, translated into five-yearly quantitative budgets from 2016 to 2050 (reflecting the UK model). This is divided into domestic reductions and the use of internationally-sanctioned carbon credits.
- It then explores how the domestic component of those targets and budgets might be met (whether, in fact, they are 'possible', and if so whether they are 'feasible' within the time-frames postulated). This is pursued within the context of both complementary measures (employed by the Government) and incentivised measures (the private sector responding to price signals, whether through a fiscal or a trading mechanism).

This conceptual and political process is assessed within the call for 'radical mitigation', and is placed within the context of a proposed National Climate Strategy and Action Plan, as called for by UNFCCC parties at Cancun in 2010.

Peter Harper, Centre for Alternative Technology

Poster title: What carbon, where and when? Internalising allocation of indirect emissions within national decarbonisation programmes

Authors: Peter Harper and Godfrey Boyle

Biography:

Peter Harper recently retired from the Centre for Alternative Technology, where he has worked for 30 years, latterly as Head of Research. He has contributed to CAT's Zero-Carbon Britain studies since their inception in 2007, with special attention to food and land use. He writes and lectures widely on carbon mitigation, emphasising the primacy of physical over political and economic processes. While he believes the State and Big Industry must inevitably do the heavy lifting in decarbonisation, he retains a strong interest in the potential role for changes in lifestyles, and has designed a number of interactive household emission calculators that allow users to explore 'alternative selves'. One of these was commissioned by the Open University as a learning tool for undergraduates in environmental courses. He spent some time as a visiting professor in Japan, and continues university teaching on a part-time basis, at the Graduate School of the Environment, Schumacher College, and the University of Bath. He favours the small collegial conference format for generating and communicating ideas. Recent examples organised by him include 'Post-Carbon Worlds and Transitions', 'Minimal-Carbon Diets', and a historical retrospective on Alternative Technology, a term he first proposed in 1972.

Abstract:

The principle of ‘cumulative carbon budgets’ (the area under the emissions curve) has emerged as a key metric, offering a useful tool to evaluate and compare decarbonisation programmes. Most such programmes adopt ‘narrow’ frames in terms of both the emission classes they embrace, and the time-frame within which emissions are counted. Such pragmatically limited frames sit well within the requirements of domestic politics, but are weak both in terms of physical realism and diplomatic robustness. To overcome these weaknesses, it is well to consider wider frames for decarbonisation programmes, evaluated by the same metric.

A ‘wide’ frame might include emissions embodied in net imports, indirect land use change, non-GHG forcing effects, allowance for delayed start, and various degrees of ‘historical responsibility’. These might all be termed ‘indirect emissions’ and it is proposed to explore the implications of internalising them within decarbonisation programmes.

To facilitate comparisons, we use a simple geometrical model that generates robust quantitative approximations. Results are evaluated against a global ‘benchmark’ of average emissions per capita over the budget period. The value for this benchmark depends on numerous assumptions, but is likely to be between 100 t - 150 tCO2e per capita between 2010 and 2050. We adopt a working value of 125 tCO2e per capita.

As worked examples, we use the official UK government emissions budgets and a recent rapid-decarbonisation plan, the Centre for Alternative Technology’s Zero-Carbon Britain scenario.

An important conclusion from these exercises is that simple decarbonisation, no matter how brisk, is rarely enough to approach the benchmark standard unless the chosen frames are very narrow. With broader (and arguably more realistic) frames there is often a large excess that cannot be met by territorial measures. The default calculus adopted gives an approximate value for this excess. An implication is that high-emitting nations such as the UK will be obliged to consider extra-territorial programmes, both of accelerated decarbonisation and carbon sequestration, in addition to rapid territorial decarbonisation.

Professor Stuart Haszeldine, Dr. Vivian Scott, University of Edinburgh

Poster title: Storing carbon – how much, how fast, and where?

Authors: Stuart Haszeldine, Vivian Scott and Mark Lawrence

Biography:

STUART HASZELDINE trained as a geologist, and has over 30 years research experience in energy and environment; innovating new approaches to oil and gas extraction, radioactive waste disposal, carbon capture and storage, and biochar in soils. He has worked on CCS since 2004, and is the worlds first Professor of CCS, sponsored by ScottishPower at the University of Edinburgh. He is Director of SCCS, the UK’s largest academic CCS research group. He was elected FRSE in 2002, awarded the Geological Society William Smith Medal in 2011, and in 2012 was appointed OBE for service to climate change technologies.

DR VIVIAN SCOTT is a Physics graduate, and took a PhD in carbon-cycle modelling. He has worked on policy studies for low carbon transitions, with specific expertise in CCS. He is currently working on carbon dioxide reduction, based at the University of Edinburgh

DR MARK LAWRENCE is an atmospheric physicist. He took a PhD at Georgia Tech, then led a group at Max-Planck-Institute for Chemistry (MPIC) in Mainz. He is now a co-Director of IASS in Potsdam and leads the EU-TRACE status examination of Climate Engineering, funded by FP-7.

Abstract:

Comparison with geological records shows that too much carbon has already been emitted by humans, and sea-level, ocean chemistry, and climates will change.

Extracting already-emitted carbon from air is often proposed as a last resort tactic. We examine the arithmetic engineering basics of any capture technology equipment. Calculations, combined with rollout constraints, show that this technology group alone/unaided is very unlikely to have the required impact nationally or globally.

By contrast, reducing the rate of concentrated emissions from power, heat or industry can be undertaken by established methods of fuel-switching from coal to gas driven by market pricing. Gas combustion can be combined with carbon capture by established process engineering, which is now poised to be scaled-up. Fuel-switching plus capture-fitting 3 such power plant per year can deliver more than the required 8% reduction, and in the UK has historical precedent – albeit with very positive finance incentives.

Storage of carbon in a form where it interacts only slowly with atmosphere and ocean (hundreds to tens thousands of years), can potentially accommodate known commercial reserves of fossil fuels if diverse and globally-distributed sites are all exploited. However the currently un-priced fossil fuel resource available is much larger. Emissions from the unfettered combustion of these fuel resources cannot be stored in known reservoirs, unless the deep ocean is utilised with consequences for future climates.

Ultimately, fossil carbon can only be burned at a rate matched by carbon storage. A radical transition away from fossil carbon as energy sources is inevitable.

Walter Jehne and Keith Thomas, Healthy Soils Australia

Poster title: Options to draw down carbon emissions by regenerating bio-systems to restore their hydrology and buffer dangerous climate extremes (*poster presented by Keith Thomas*)

Biography:

Walter Jehne is a Soil Microbiologist with extensive experience with CSIRO in Forestry, Tropical Crops and Pastures and Soils Research and in strategic policy areas to help regenerate agro-ecosystems and degraded landscapes. Current research via Healthy Soils Australia, an NGO of leading farmers and scientists focused on regenerating the health and resilience of our soils and landscape, has focused on how practical grass roots regeneration strategies can secure our essential water, food, and bio-system needs and help buffer dangerous aridification and climate extremes already impacting Australia. While Australia's unique natural bio-systems and leading land managers confirm that we can regenerate degraded bio-systems and thereby restore the hydrological and cooling processes that govern our safe climate, we must extend such actions globally and urgently to secure our safe climate. Current efforts focus on catalysing this practical, commercial change, in time.

Abstract:

Given global climate change and past delays, neither business as usual nor ‘radical’ reductions in future emissions can now avoid the intensification of dangerous climate extremes and their impacts.

Instead, urgent action is needed regionally to:

1. Regenerate the health and resilience of bio-systems so their restored hydrology can buffer these extremes and secure essential water, food and habitat needs.
2. Cool local climates hydrologically to help offset dangerous climate feedbacks.
3. Restore the natural carbon bio-sequestration potential and soil sinks that governed natural bio-systems their hydrological dynamics and our safe climate.

As demonstrated in nature, and by leading land managers we can do this, if we urgently regenerate these natural bio-systems and processes to;

1. Limit the loss of up to 2 GtC/an by reducing the burning of natural rangelands.
2. Limit the oxidation of up to 3 GtC/an from agricultural soils via more efficient fertilizer use.
3. Enhance the natural draw down of up to 10 GtC/an, or 10% on net primary productivity, by regenerating the world’s former forests and grasslands.
4. Limit the microbial oxidation of up to 10 GtC/an from the soils of these bio-systems through restoring more natural microbial ecologies.

The paper documents the science, practical methods and evidence to drive this reduction in emissions and draw down of an additional 20GtC/an, to offset our current net deficit of 10 GtC/an and slowly reduce CO_2 levels.

The paper outlines the policy incentives and practical global action needed to achieve this ‘existential imperative’, hopefully in time.

John Jopling, Feasta

Poster title: Creating new global governance structures

Biography:

For 30 years John practiced as a barrister in London advising clients about the law of trusts. Increasing awareness of the deep-seated flaws in mainstream economic and political systems led to using his professional expertise to help establish a number of new institutions, including FIELD the Foundation for International Environmental Law and Development and Feasta the Foundation for the Economics of Sustainability. Publications include two Feasta Reviews, edited jointly with Richard Douthwaite, and the Schumacher Briefing "Gaian Democracies", written jointly with Roy Madron.

Abstract:

The paper's first proposition is that existing governance structures and market forces will not be able achieve the necessary rapid, deep and early reductions in energy consumption required to prevent severe climate change. The paper points to components of the current systems that ensure that it is systemically incapable of achieving the necessary reductions. New governance structures are therefore needed to achieve the necessary reductions. The current system is also incapable of adding to or amending its own capabilities to create these. The paper asserts that some sort of new initiative independent of current governmental systems is needed.

The main questions addressed are: what might the necessary new governance structures look like, and how might they be constructed?

The paper's answer to the first question is the creation of a global climate commons institution operating independently from, but cooperatively with, nation-state governments. It would claim to be 'owned' by the whole living world, so as to include future generations and other species. It would take evidence and advice to decide what schemes to introduce to achieve the necessary reductions. These could include schemes such as Cap and Share (a global upstream cap on the entry of fossil fuels onto the market and a fair sharing of the scarcity rents).

The paper finally reports a number of initiatives through which the necessary new arrangements might emerge from out of the current world regime. These include the use of the law and the courts; and crowdsourcing for various purposes

Shashikant, Indian Institute of Technology Bombay

Poster title: Experimental study of leaching and CO_2 sequestration in steel slags

Authors: Shashikant and Anurag Mehra

Biography:

I have completed my B.E in Chemical Engineering, from DCR University of Science & Technology, Murthal in 2008 and M.Tech in chemical engineering from IIT Roorkee with specialization in COMPUTER AIDED PROCESSPLANT DESIGN in 2010. During my academic career I have studied various advanced courses of chemical engineering, viz., Chemical reactor analysis, Reaction engineering in dispersed phase, Advanced reaction engineering, Advanced transport phenomena, CAD of heat transfer, CAD of mass transfer, Process integration, Optimization of chemical processes etc. I have decided to do research in the field of Chemical Engineering. All my learning and project work for the past few years have revolved around this area, and I have decided to make my career in that field. As a researcher, I am more interested in the practical perspective of research, namely system design, experimentation and implementation, rather than theory. Currently, I am pursuing my PhD in Chemical engineering from IIT Bombay under the guidance of prof. Anurag Mehra. I am doing research on carbon Sequestration by Carbon Dioxide absorption in Mineral Slurries and Industrial waste to study the rates of absorption of carbon dioxide in aqueous suspensions of selected minerals and slags with the objective of identifying effective absorbents, and assessing the speed of capture. The project also has a theory/modelling/ computational element where we are developing transport phenomena, reaction kinetic based models for these experiments.

Abstract:

Interest in long term storage of large amounts of CO_2 using mineral sequestration or mineral carbonation, is growing in many regions, especially where CO_2 underground sequestration is not possible or considered unfeasible. Magnesium (Mg) and calcium (Ca) rich minerals are the most abundant minerals involved in carbonation reactions. Several industrial residues and by-products, such as iron and steel slags, various process ashes, and cement-based materials have potential for carbon sequestration because of high concentrations of calcium and magnesium based compounds present in it. Although the amounts of by-products and residues are much smaller than natural resources, but they are readily available, continuously produced, and tend to be more reactive than natural minerals. Also end product may have industrial uses (like pure $CaCO_3$).

Objective of this work is to study the capacity of sequestration by different type of slags under different operating condition and to investigate the effect of carbonation on mineralogy and leaching behaviour of slags. Experiments were performed in a semi batch reactor to measure the reaction rate between industrial steel slags and carbon dioxide in an aqueous medium. Two type of steel slag samples were obtained from different steel plants in India. For initial experiments two size friction of 25-37 µm and 53-75 µm were selected for experiments. All the experiments were performed under atmospheric pressure at 25° and 90°C with reaction time of 240 hours.

Dr. Gavin Killip, Environmental Change Institute, University of Oxford

Poster title: Integrating innovation of products, practices, and processes: Transforming the market for low-energy renovation of existing housing

Biography:

Gavin Killip is a senior researcher at Oxford University's Environmental Change Institute. He had ten years' experience of energy efficiency and renewable energy projects in the voluntary and public sectors before turning to research in 2004. He did an MSc in Advanced Energy and Environmental Studies at the University of East London/Centre for Alternative Technology before completing his PhD at Oxford University. His research focuses on delivery mechanisms for a low-carbon housing stock, particularly the role of SME building firms. He takes a broadly socio-technical systems approach, with a particular focus on the practices and established processes of 'intermediary' groups in the task of technology take-up. He has refurbished his own terraced house in Oxford to achieve a 65% reduction in CO_2 emissions, as well as reducing other environmental impacts. He is a member of the Super Home network, which organises open house events and other activities using members' renovated eco-houses as demonstrations of the possible.

Abstract:

Models and scenarios repeatedly identify buildings as a significant source of global CO_2 emissions, but with large potential for deep emissions reduction through technology take-up. The observation that mature, cost-effective technology is not being adopted at scale suggests that this is as much a market breakthrough problem as a technology breakthrough problem.

A parallel is drawn with historical policies to improve the energy efficiency of domestic appliances, from which certain principles can be derived about a) which combinations of policy are most promising in different contexts; and b) how technical improvements and diffusion rates can both be accelerated.

Adapting these principles to the market for building renovation needs to take account of the complexity and multiplicity of markets and actors, but also the different model for innovation which operates in project-based service industries, such as construction.

In order to deliver appropriate real emissions reductions, several things are needed: create a market; provide appropriate training; overcome (or at least minimise) the observed disparity between building design and performance; incorporate the role of the occupants as part of the 'building as a system'. Information feedback loops are needed to create a culture of continuous learning among citizens and professionals alike, with a central coordinating role which requires much closer collaboration between policy, industry practice and research.

Mike Koefman, Planet Hydrogen

Poster title: The "3 R's" of climate remediation: From technical plausibility to electoral acceptability

Biography:

Originally a teacher of English and French as second languages in the UK, Algeria and Zambia, a steadily enhanced awareness of the environmental stresses affecting the whole planet, including its human population, led him to take very early retirement in order to study the essential sciences needed to "get a handle" on the challenges facing us. After acquiring a BSc through joint credits at Manchester Metropolitan University and the Open University (chemistry, physics, mathematics, sustainable energy, oceanography) he was one of a small team of hydrogen enthusiasts to found in 2001 an NGO (which subsequently became "Planet Hydrogen") whose aim was to advocate the rapid and entire replacement of fossil fuels with renewably generated hydrogen, for the sake of the climate. Such single-minded naivety could not last, as our awareness developed of the many different opportunities for climate change mitigation, and of the many technical, political and institutional hurdles which impede effective action. As an organisation we have gained observer status at the IPCC and the UNFCCC, and have contributed to climate mitigation assessments at local and national levels. Koefman has delivered a series of courses on climate for the public in Manchester, and given seminars at many levels, including primary and secondary schools, colleges and universities, and citizen groups.

Abstract:

It is proposed that three fundamental measures, the "3 R's", are needed to restore the climate system to a de-stressed equilibrium: Restraint in all energy use; Re-fuelling human society so that fossil carbon is entirely eschewed, in favour of solar heat, renewable electricity and renewably generated hydrogen; Retrieval and immobilisation of excess carbon dioxide from the atmosphere.

Expert opinion on climate change mitigation is increasingly focused on the necessity of reducing CO_2 atmospheric concentrations, rather than on the mere limiting of annual emissions to a politically acceptable level.

Public opinion within even well informed societies is easily persuaded that there is no viable alternative to fossil fuels for household, transport, industry and electricity generation. It will be essential to bridge this gulf between, on the one hand, the certitudes of climatology (and of oceanography, where concerns about acidification are already acute), and on the other hand the doubts and hesitations of the voting public. It is asserted here that the "3 R's" in question are worthy of technical assessment at the deepest level, and equally are comprehensible by the general public. Herein may lie a politically effective unity between lay and expert opinion, based on shared perceptions of the necessity and plausibility of these three measures.

Mieke Langie, WindMade

Poster title: The WindMade label: Fostering renewable energy use in products and companies worldwide

Biography:

Mieke Langie joined WindMade as Director Standards & Labeling in October 2011, where she is responsible for all technical aspects of the labeling program, including the development and integrity of the standards as well as the interaction with WindMade members and third party verifiers. Prior to joining WindMade, Mieke worked for EDF-Luminus, the second largest electricity producer and energy supplier in Belgium, as Commercial Manager Green Energy & Carbon. She was as such responsible for the company's obligations in Green and Cogen Certificates, Guarantees of Origin for fuel mix disclosure and CO_2 emission rights trading under the EU ETS obligations. Before this, Mieke worked in the sales department of Belgian wind turbine manufacturer Turbowinds and was one of the authors of the 'Windplan Flanders', a study for the possibilities of wind energy in Flanders, led by the Free University of Brussels.

Abstract:

WindMade is the world's first consumer label for companies and products using wind power and renewable energy. WindMade provides a bridge between consumers demanding transparency and companies committed to sustainability. The purpose of WindMade is to increase globally the use of wind power, thereby contributing to the prevention of climate change and to the promotion of resource efficiency and energy security.

The presentation will show and explain how the labelling program works and how it can influence consumers, and brings benefit to all involved companies.

There are three standards in the WindMade portfolio: the Standard for Companies and Organizations, the Standard for Events and the Standard for Products and Services. The standards describe how wind energy and other renewable electricity have to be sourced in order to be eligible for WindMade certification, and which other minimum requirements need to be met. There is a strong focus on high credibility of the label through the avoidance of double counting and third party verification.

WindMade is an independent non-profit organization founded in 2011 and governed by a Board of Directors. The initiative is supported by a unique consortium of founding partners, including WWF, UN Global Compact, Vestas, Lego, Bloomberg, Global Wind energy Council and PwC.

Dr. Sarah Mander, Tyndall Manchester

Poster title: Enabling high penetration of renewable generation – the role of demand response

Authors: Sarah Mander and Dana Abi Ghanem

Biography:

DR SARAH MANDER is a Research Fellow at the Tyndall Centre for Climate Change Research at the University of Manchester and co-leader of the Governance and Behaviour theme within the national Tyndall Centre. Her work is interdisciplinary in nature, with a particular focus on integrating stakeholder and public perspectives with technical and modelling assessments.

DR DANA ABI GHANEM is a Research Fellow at the Sustainable Consumption Institute at the University of Manchester. Her research interests lie in electricity consumption and smart grid development, renewable energy technologies, consumption and everyday practices.

Abstract:

Demand side management strategies have come to the forefront of research on energy efficiency and electricity networks, amongst them automated demand response technologies that facilitate the response of household electricity consumption to supply conditions. Demand response is envisaged as an integral element of a transition to 'smart grids' to enable the management of an electricity network with a very high penetration of distributed and renewable generation.

This paper draws on findings from an industry-led project on the development and testing of active demand side management (AD) principles and technology. The technology, an automated demand response system installed in households, allows the provider to remotely shift electricity load for appliances as well as control comfort, heating and other services, based on consumer-informed programme settings.

Exploring how the different users incorporate this technology into their daily routines, and the acceptance of demand response following the field trials, we reflect on the potential for demand response to manage the consumption of controlled loads within homes. Considering how demand response can contribute to reducing the carbon intensity of electricity supply – through facilitating the penetration of renewable electricity generation and shaving peak demand, thereby avoiding the use of high carbon back-up plants) – people's acceptance of load control is key to the effective implementation and use of AD. We discuss our findings in relation to how households have adapted and how would they consider adopting AD solutions in the future.

Linus Mattauch, Mercator Research Institute on Global Commons and Climate Change (MCC)

Poster title: The behavioural economics of mobility

Authors: Linus Mattauch, Monica Ridgway and Felix Creutzig

Biography:

Linus Mattauch is in the final stages of his PhD at the Mercator Research Institute on Global Commons and Climate Change at Berlin. He is supervised by Professor Ottmar Edenhofer, Co-Chair of Working Group III “Mitigation of Climate Change” of the IPCC. His research interests, besides the decarbonisation of the transport sector, are welfare theory and public finance with a focus on rent taxation. Before embarking on graduate studies in climate change economics, Linus studied mathematics and philosophy at Oxford University and ENS Paris.

Abstract:

Avoiding dangerous anthropogenic interference with the climate system necessitates a substantial, non-incremental decarbonisation of the transport sector. While technological options for low-carbon mobility have been discussed extensively and are the focus of mitigation policies and pilot projects, behavioural options are rarely studied methodically and remain outside the focus of policy makers.

In this paper we draw on insights from behavioural economics, psychology and welfare theory to explore systematically how transport users make mobility decisions and whether it is desirable to modify them by policy interventions. Contrary to the assumption that travel is derived demand, behavioural economics and psychology contend that mobility decisions are not utility-maximizing in a non-vacuous sense of the term. A classification of relevant 'non-standard' choice mechanisms is introduced: we examine which preferences, heuristics and decision processes highlighted by behavioural economics are relevant for mobility behaviour, such as mode choice, commuting, purchasing vehicles, fuel economy and safety considerations. The influence of the infrastructure on the formation of travel preferences is also investigated.

We then argue that some of these choice mechanisms are crucial for the successful design of policy instruments aiming at a non-incremental decarbonisation of the transport sector – particularly with regard to environmental awareness, demand reduction, fuel economy and the influence of infrastructure on preferences. We assess positive side effects of decarbonisation policies such as improved health or greater social cohesion, using two distinct normative viewpoints prominent in current welfare theory: liberalism and maximization of subjective well-being.

James McKay, University of Leeds

Poster title: Dreams of a low carbon future

Authors: Paul Williams, James McKay, Ben Dickson, Paul Gravett and Ms Nicola Smith

Biography:

PROF PAUL WILLIAMS is director of the EPSRC-funded Doctoral Training Centre in Low Carbon Technologies at the University of Leeds. He is a Professor of Environmental Engineering with a research background in energy, fuels and materials recovery from wastes. He is a Chartered Engineer and Fellow of the Energy Institute and has published >350 academic papers with >7000 citations to his work (Google Scholar). He has been awarded EPSRC research grants and EC, Defra, DTI (TSB) and numerous industrial research grants, totalling over £10m. His research work has been honoured by several awards, most recently, the 2012 Distinguished Guest Lecturer medal of the Environmental Chemistry Group of the Royal Society of Chemistry.

JAMES MCKAY is the manager of the Doctoral Training Centre in Low Carbon Technologies at the University of Leeds. He is also an acclaimed graphic novel artist, shortlisted for 'Best New UK Graphic Novel Artist 2009' in the annual Arts Foundation Awards. His published graphic novels include the 'City of Secrets' series for Mosquito Editions, France, and 'Flesh' for 2000AD magazine. James' artwork can be seen at www.jamesmckay.info

Abstract:

The authors present a graphic novel (comic) entitled 'Dreams of a Low Carbon Future', a collaboration between school children, artists, writers, industry and engineering PhD researchers, funded by the Royal Academy of Engineering 'Ingenious' scheme for public understanding of science.

The project aims to enable a greater understanding of the issues of climate change and how we transition to a low carbon sustainable future through radical emissions reductions by VISUALISING the results of different scenarios or pathways our society may take. The authors will explain how the project was carried out and give audience members free copies of the graphic novel (on the understanding that they will be contacted to fill out an online questionnaire giving their opinion of the book).

The subjects covered in the graphic novel include the history of energy use; how we arrived at our present situation of reliance on fossil fuels; an overview of climate change science; the supply technologies that could be used in the transition; and an overview of the issues of demand. The second half of the book features contributions including artwork and concepts from school children, comics artists, playwrights, and scientists and focuses on visualising various possible SUSTAINABLE "UTOPIAs" and also "DYSTOPIA" (essentially visualising what will happen to our world if we continue business-as-usual)

Dr. Laurence Matthews, Cap & Share UK

Poster title: Now you see it, now you don't

Biography:

Laurence Matthews is Chairman of Cap & Share UK, and is the author of several articles on Cap & Share. After a doctorate in mathematics from Oxford University and research at the University of Bonn, he was a lecturer at Sussex University. He has also worked as a statistician and economic forecaster in the transport industry, initially for British Rail and later

for BAA plc (formerly the British Airports Authority), where he carried out consultancy work on five continents. He is married, and the couple are joint authors of a best-selling book on Chinese characters.

Abstract:

Radical emission reductions will need radical ideas, not least in the field of global governance. But the simplest radical ideas can be the hardest to grasp.

This paper draws on lessons learned from several years' experience of promoting the policy instrument 'Cap & Share'. In discussions with researchers and policymakers, a frequent source of confusion has been that Cap & Share rejects several assumptions which underlie the dominant proposals for emission reduction policies. It is often a struggle, as much for experts as for the general public, to bring into focus those implicit assumptions. But 'reframing' can only occur when the original frames are seen clearly rather than remaining hidden and unexamined.

The same applies to issues of global governance. Radical emission reductions not be achieved by technology alone, nor by reductions in energy demand in particular locations or sectors; they will require global economic policies implemented by strong political action. The current framing of political capabilities is clearly inadequate to this task. The paper outlines several facets of this framing, and 'thought experiments' are then used to probe alternative approaches to questions of legitimacy, efficacy and equity.

Gbemi Oluleye, University of Manchester

Poster title: Reducing emissions from the process industry through waste heat recovery

Authors: Gbemi Oluleye, Megan Jobson and Robin Smith

Biography:

GBEMI received her BSc in Chemical Engineering from Obafemi Awolowo University Nigeria and MSc from The University of Manchester and is currently pursuing her PhD at the same university. Her research interests include CO_2 emission reduction and increasing efficiency in the use of fuel through energy supply integration. To this end, she participated as a research assistant in the Energy Technology Institute Macro DE project; the project objective was to quantify opportunities for distributed energy in England. She has also worked as a process engineer focusing on increasing efficiency in fuel use for refineries and petrochemical plants. She is being supervised by Megan Jobson and Robin Smith.

DR MEGAN JOBSON graduated with a BSc in Chemical Engineering and completed her PhD at the University of the Witwatersrand in South Africa. She is a senior lecturer in the Centre for Process Integration, University of Manchester.

PROF ROBIN SMITH graduated with bachelors, masters and PhD degrees from the University of Bradford. He has extensive industrial experience with Rohm & Haas in process investigation and process design, and with ICI in process modelling and process integration. He has acted extensively as a consultant in process integration projects. He has published

widely in the field of process integration and is author of Chemical Process Design and Integration, published in 2005 by Wiley. He is a Fellow of The Institution of Chemical Engineers, a Chartered Engineer and a Chartered Scientist. His main research interests include design of site utility systems, cleaner production and water system design.

Abstract:

Despite policies [1] [2] and concepts [3] [4] [5] to increase energy efficiency in the process industries, a considerable amount of energy is wasted, especially at medium to low temperatures [6]: in process industries over 72 X 10^{12} Wh is wasted annually [6].

Recovery and re-use of waste heat can reduce a process site's carbon dioxide emissions both directly and indirectly from using recovered energy within the process site and over the fence (off-site).

In this work, a methodology is presented for identifying and evaluating opportunities for waste heat recovery in existing process sites; the methodology extends concepts of process integration and allows for both on-site and off-site use of recovered energy. Mathematical models of waste heat recovery systems are developed to support analysis of heat recovery options.

The methodology is applied to a case study for a refinery and the best waste heat recovery scheme reduces site emissions by 19%, improves site energy efficiency by 23% and reduces operating costs by 20% with a 2 to 4 year payback. In this case study, both on-site and off-site reuse opportunities were considered.

It is concluded that the methodology has potential to identify, screen and select waste heat recovery options for a process site.

Results suggest that recovery of waste heat can reduce emissions from fuel combustion, increase efficiency in fuel use and reduce cost of energy provision in process industries.

References:

1 Intergovernmental Panel on Climate Change, 1997. Stabilization of Atmospheric Greenhouse Gases: Physical, Biological and Socio-Economic Implications, s.l.: IPCC Technical Paper III.
2 International Energy Agency, 2008. Towards a sustainable Energy future. [Online] Available at: http://ccs101.ca/assets/Documents/g8_towards_sustainable_future.pdf [Accessed 3 June 2013].
3 Smith, R., 2000. State of the art in process integration. Applied Thermal Engineering, Issue 20, pp. 1337-1345.
4 House of Parliament, 2012. Low Carbon Technologies for Energy Intensive Industries, London: The Parliamentary Office of Science and Technology.
5 Linnhoff, B. & Hindmarsh, E., 1983. The pinch design method for heat exchanger networks. Chemical Engineering Science, 38(5), pp. 745-763.
6 Ammar, Y. et al., 2012. Low grade thermal energy sources and uses from the process industry in the UK. Applied Energy, pp. 3-20.

Dr. Jane O'Sullivan, The University of Queensland; Roger Martin, Population Matters UK

Poster title: Population and climate change: Reducing emissions by reducing future demand, through family planning and women's empowerment

Biography:

An agricultural scientist and environmental activist, DR. O'SULLIVAN became involved in Australia's national debate about the form of a carbon price, speaking in public debates and publishing articles on the issue. As a systems analyst, she found the claimed benefits of cap-and-trade systems to be poorly founded, but support persisted either for the cynical reason of providing a "get out of jail free" card for Australia to purchase its reduction commitments from others, or for ideological reasons, falsely believing that a cap on permits secures a cap on emissions and that trading minimises the cost of emissions reduction. She was frustrated by the tangled web of misconceptions and the determination of environmental activists to regard any criticism of the cap-and-trade proposal as climate change denial. She remains convinced that strong climate change mitigation is not possible in democratic countries without an economy-wide and unilaterally adjusted, consumption-basis carbon tax.

ROGER MARTIN has had two careers: as a diplomat (in Africa, Asia, the UN, and Middle East, resigning 'in fury' as a Deputy High Commissioner); and an environmentalist (Director of Somerset Wildlife Trust, national Trustee and SW Regional Chair of CPRE, founder 'green' rep on SW Regional Assembly, founder Chair 'Sustainable Somerset Forum', Secretary of State rep on SW Environment Agency flood defence and environmental pollution committees, Regional Agriculture Panel and National Park Authority, founder Chair SW regional Biodiversity Action Plan, regional Water Framework Directive committee etc, with experience also of planning, transport, energy, waste, etc). As chair of Population Matters, Roger has put the main focus on campaigning, supported by research and education, and has increased the number our contacts and the profile of our Patrons. He has spoken at conferences and meetings in ten countries, and many more in the UK, and undertaken many interviews and broadcasts on behalf of Population Matters.

Abstract:

"It's no use reducing your footprint if you keep increasing the number of feet".

At the 1994 UN Cairo Population Conference all nations committed to universal access to reproductive health for women. Support for family planning has since shrunk dramatically, the number of women with unmet need for contraception has doubled, and global population growth has surged. The UN population projections (2012 revision) shows recent growth following the constant fertility projection, which voids existing emissions pathways to below $2^{o}C$.

This study finds that renewed commitment to family planning could make achievable a peak population below 9 billion. Continued neglect will exceed 11 billion unless capped by mortality.

The few emissions projections which have varied population independently found dramatic impacts. Energy demand reduction from lower population path could achieve 16-29% of the carbon reductions needed by 2050. Additionally, emissions from agriculture and deforestation are vastly elevated by higher population projections, requiring net sequestration in energy and process sectors to remain below $2^{o}C$.

Family planning reduces emissions more cheaply than renewable energy technologies. Net cost is negative. Reduced demand increases the impact of all other mitigation measures. Co-benefits include environmental protection, resource conservation, economic development, maternal/child health, nutrition, conflict avoidance, and gender equity.

Action is urgent. The lost years since Cairo have already shifted the pathway from medium to high projection, which if continued would increase energy demand to 2100 by 20-30% and land use change by 190% over current estimates.

Dr. Liam Phelan, University of Newcastle, Australia

Poster title: Achieving radical emissions reductions by undermining perverse resilience

Biography:

I am a Senior Lecturer and the Online Teaching & Learning Coordinator with GradSchool, University of Newcastle, Australia. My primary research interests are: complexity theory; political economy; Earth system thresholds; climate change; finance (especially insurance); learning communities; educational leadership; pedagogy of online teaching and learning. I was awarded a PhD in 2011 (Macquarie University, Sydney) and I have published widely (~20 articles) in the areas noted above. I have received awards for research and teaching, including the: (i) Eric Anderson Award for best article in *Australasian Journal of Environmental Management* (2012); and (ii) a national Office for Learning and Teaching National Citation 2012 for Outstanding Contribution to Student Learning. My professional background is in leadership positions with civil society organisations, including Executive Director with AID/WATCH (1999-2000) and National Campaigns Coordinator with the Australia Tibet Council (2001-05). In 2005 I was a co-recipient of the international Free Spirit Award for Tibet campaign work.

Abstract:

This paper employs a conceptual linkage between resilience – from resilience approaches to social-ecological systems – and hegemony – from neo-Gramscian political economic analysis – to suggest fruitful strategies for achieving radical reductions in greenhouse gas emissions. The Earth system is a complex adaptive system, characterised by non-linear change and with significant capacity for surprise. In times of systemic crisis, such as dangerous anthropogenic climate change, perverse resilience (for example the structural power of fossil fuel interests in the global economy) can threaten overall Earth system stability. Resilience approaches describe social-ecological systems but neglect the significance of norms and power relations in human societies. In contrast, critical political economic analyses recognise climate change as a threat with significant political economic characteristics and implications, but mischaracterise or underestimate key dimensions of climate change as a globally coherent phenomenon, including the important implications of Earth system dynamism and non-linear change. I argue that earlier and continuing justice movements that entailed radical change such as the anti-slavery and universal suffrage movements provide inspiring models and metaphors for achieving radical socio-political change, but that using environmental justice as a framework to achieve radical emissions reductions calls for grounding tangible strategies and policy choices in Earth system reality. The potential of this approach is demonstrated with reference to three conceptualisations of the Earth system: (i) the Earth's atmosphere having an emissions capacity of 'one trillion

tonnes', (ii) the risk of continuing emissions 'locking in' Earth system change, and (ii) the call to 'leave [unexploited fossil fuels] in the ground'.

Robert Rattle

Poster title: Technical and policy options to change behavioural onus and drive radical emission reductions

Authors: Benjamin Rattle, Christopher Rattle and Robert Rattle

Biography:

Robert is an independent scholar, consultant, researcher and part time faculty member at a small Canadian college. He has expertise with, and interests in sustainable consumption, social determinants of health, Health Impact Assessment, Internet and communication technologies, and globalization. He focuses on generating rich and informative theoretical and practical opportunities for equitable and sustainable decision making. Benjamin and Christopher were senior primary school students at the time of the idle free project (winter 2013).

Abstract:

Wasteful idling can easily become common practice because reducing wasteful idling requires thoughtful intervention in accustomed behaviour. Behavioural psychology suggests a reverse onus practice that can help create the necessary structural conditions to facilitate environmental behaviour. This project discovered the challenges of creating environmental behaviour without the reverse onus principle in place. The project consisted of a web site, and a contest for students in a mid-sized Canadian town. The web site is a place where anybody that wants to learn more about wasteful idling can get information about the issues. The contest was a video contest to encourage students to produce a short video capturing the needlessness of idling, and its impacts. The idle free project was part of our media, science and language curricula. The goal of the idle free project was to reduce GHG and air pollutant emissions and their impacts by: educating citizens; reducing unnecessary idling; and supporting legislation and other actions. This project demonstrates the need to link behavioural psychology with technical interventions to produce the requisite change for environmental behaviour which could drive radical emission reductions. This presentation will describe the results of yet another idle free campaign to reduce unnecessary idling and GHG emissions. It will suggest technical and policy changes to help future similar behaviour campaigns achieve radical emission reductions.

Dr. Kate Rawles, University of Cumbria and Outdoor Philosophy

Poster title: Radical reduction, values change and outdoor philosophy

Biography:

Dr Kate Rawles studied philosophy at Aberdeen University, and environmental philosophy at Glasgow and Colorado State University. She was an indoor philosophy lecturer for nearly a decade before escaping to work freelance in 2000. Kate now works half-time as a lecturer in Outdoor Studies at the University of Cumbria – teaching environmental issues – and half-time as a freelance outdoor philosopher, writer, lecturer and campaigner. She is passionate about the need to find urgent, effective and suitably radical responses to our multiple environmental challenges (including giving our values and world views a thorough overhaul) – and firmly believes our quality of life can go up rather than down in the process. Kate is a keen hill-walker and sea-kayaker (with a particular love of remote islands with lots of wildlife) as well as a long-distance cyclist. She is a Fellow of the Royal Geographical Society and sits on the Food Ethics Council. She lives in Cumbria with her partner, Chris.

Abstract:

A sustained radical reduction in emissions requires profound change in values as well as technology and behaviour. This is in relation to values as held by individuals and, crucially, as embedded and manifested in social, political and economic structures. Achieving this values-shift is a fundamental challenge. One of the ways of inducing such a shift is through a 'jolt' in thinking and experiencing. *Outdoor Philosophy* is a practical way of delivering a 'jolt'. Outdoor Philosophy is a training programme with two distinct elements: the experience of relatively wild, wildlife rich environments – often emotionally impactful in itself, together with critically engaged debate about the values that inform dominant, high-consumption models of quality of life, a growth-dependent economic system and a highly instrumentalised relationship with natural systems. It seeks to facilitate an opportunity to view 'normal' high-impact industrial lifestyles and social structures from a different perspective and to inspire and support both deep personal change and the need for non-incremental systemic change. Outdoor Philosophy 'graduates', including civil servants, academics, educationalists, authors and business-people, report a deeper understanding of the scale of the climate challenge, and a stronger motivation to act and engage others. This helps them to build the case for radical emissions reduction within their professional and personal lives.

Dr. Tim Rayner, Tyndall Centre, UEA

Poster title: not provided

Authors: Tim Rayner, Andrew Jordan, Heike Schroder, Corinne Le Quere et al.

Biography:

The first three authors are part of the 'governance and behaviour' theme, the fourth is director of the Tyndall Centre for Climate Change Research.

Abstract:

Since the mid-1990s, the target of limiting average global temperature rise to within two degrees celsius (above pre-industrial levels) has become firmly entrenched in the policy discourse and, more latterly, the international legal regime associated with climate change. In the past few years, however, the likelihood of achieving it has been increasingly called into question. The debate around what should be done if, as now seems ever more probable, the target is deemed to be unreachable, is only just beginning. This paper seeks to

move beyond the somewhat binary debates about whether or not it should or will be met, to analyse more fully the likely implications of adopting alternative options. For the first time, it identifies the risks and opportunities associated with four such options: *1. 'Mitigate for two degrees, adapt for four'; 2. Adopt new metrics; 3. Be politically opportunistic; 4.'Recommit to staying within two degrees'.* It finds that the significant risks and uncertainties associated with some of them may encourage decision makers to recommit to the two degrees target as the least unattractive course of action.

Daniel Rossetto, Climate Mundial Limited

Poster title: Reforming Europe's emissions trading system: A solution that encourages energy efficiency but does not collapse demand for allowances; achieved through appropriate reforms to the ETS

Biography:

Daniel Rossetto is Managing Director of Climate Mundial Ltd and is responsible for the firm's strategy, business development and operations globally, based in London. Climate Mundial staff have unparalleled experience working in carbon price risk management, emissions reduction project origination, structuring and finance and emissions trading over the past 15 years, within major corporations and public agencies across the utility, government policy and financial services sectors. In Australia, the firm is currently engaged with Baker & McKenzie, Climate Works Australia and Seed Advisory on the preparation of a Carbon Decision Making and Risk Management guide for the Carbon Market Institute. Climate Mundial was one of the first companies to be granted an Australian financial services license covering carbon emission units by ASIC. Prior to joining Climate Mundial in 2012, Daniel was Executive Director (Environmental Markets) at J.P. Morgan, where he delivered a number of first of a kind structured emission unit transactions across major emerging market countries and regions, including India, Russia, the Middle East, Brazil, Mexico and China. Notable among these was origination of one of the first UNFCCC registered Joint Implementation projects approved in Russia, the 2.5m tonne per year Yuzhno Balyksky associated petroleum gas recovery project with Sibur Holding and Rosneft. While at J.P. Morgan, Daniel was responsible for the firm's advisory work for the Australian and New Zealand governments on emissions trading scheme design during 2008-09. Daniel also led the firm's involvement in a consortium featuring J.P. Morgan, Baker & McKenzie and Ernst & Young on a major advisory assignment in 2009 for the Queensland government, which analysed the possible role for State governments in supporting industry with the transition into the Carbon Pollution Reduction Scheme (CPRS).

Abstract:

Climate Mundial has analysed energy use and carbon emissions data across Europe over the last decade and finds that companies and businesses respond to higher energy and carbon prices across Europe by increasing the efficiency of their energy use.

As an industry first, this Paper considers the decisions taken by the European Commission on National Allocation Plans for Phase II of the EU ETS and analyses their impact on the current physical Surplus of European Allowances (EUA), which Climate Mundial estimates could reach 1.8 billion by April 2013. This fully comprehensive paper is a collation of qualitative and quantitative data, information tools and ideas which are analysed across a

single platform, leading to the solutions to challenges and opportunities as recommended by the Author.

The response phenomenon is most evident in the earlier years of Phase II of the EU ETS, in particular when carbon prices had peaked at almost €30/tonne during mid-2008. Energy efficiency response is part of an overall trend across Europe - in which countries within the block's carbon intensity levels (tCO2-e emissions per unit of GDP) are reducing in the range of 2-2.5% per year – a phenomenon foreshadowed by the PRIMES modelling: and considered by the European Commission in its assessment of National Allocation Plans for Phase II.

Energy efficiency projects – which include measures such as boiler retrofits, heat recovery systems, lighting retrofits and insulation of thermal systems and automated control system optimisation in facilities ranging from power plants, to factories and buildings - have long lives. Their implementation reduces demand for carbon allowances.

Climate Mundial estimates this is responsible for almost half of the current EUA surplus.

Response is part of a continuum: short market, triggering high carbon prices, followed by response (abatement) and ending with low carbon prices. Much more effort is needed in Europe (as well as the world over) to bring abatement levels into line with scientific advice and a healthy carbon market – and a strong price signal - is fundamental to achieving this.

The European Commission is therefore urged not to implement back-loading, as such a measure would turn the continuum into a cycle. Contrary to the European Commission's view, back-loading would have the opposite effect of what is intended. The Author, instead, calls for the design of a mechanism to update the Community-wide emission cap at the end of the current phase on an annual basis, similar to the Australian carbon scheme's cap system, as a matter of urgency. The structural changes should be implemented immediately, but change the structure of the EU ETS only from the beginning from 2021.

In conclusion, only this mechanism would ensure that energy efficiency continues to be encouraged, but avoids repeating the same unintended impacts in Phase III and beyond. The Author concludes that, unless the recommended measures are taken, back-loading will negatively affect the ultimate goals the European energy industry is striving for.

Thomas Rushby, University of Southampton

Poster title: Household carbon allocation for domestic energy demand reduction

Biography:

I joined the University of Southampton in January 2011 as a research assistant working on the RCUK funded project 'Community-Based Initiatives in Energy Saving'. The 4 year study aims to assess the impact of community greening groups on a roll out program of insulation upgrades in privately owned housing'. In October 2011 I was awarded an ESRC studentship for interdisciplinary study under the Energy, Environment and Resilience research pathway. My research interests include: energy performance of buildings, energy practices, energy and climate change policy, and specifically demand reduction. Prior to joining the University I completed an MSc in Architecture: Advanced Environmental and Energy Studies at the

University of East London. The title of my MSc thesis was 'An investigation into a needs-based approach to setting carbon allowances under personal carbon trading'. This work developed a novel approach to allocating emissions rights under a carbon trading scheme for domestic energy consumption. My current research aims to extend this work and to explore the political and institutional framing of PCT policies, and the opportunities and barriers to implementation of such schemes in the policy process.

Abstract:

Personal Carbon Trading (PCT) is a policy proposal that could potentially provide a framework for radical greenhouse gas emissions reduction. The idea has received interest from senior political figures and has been the subject of a pre-feasibility study by the UK Government. Barriers to the progress of PCT as a policy option include issues around cost effectiveness, household income redistribution, public opinion and political acceptability. Lack of development of the policy in response to these issues has tempered support for PCT.

Proposed PCT schemes most commonly use an equal-per-capita allocation (EPCA) to distribute emissions rights among the population and do not take into account circumstantial factors affecting per-capita emissions. While attempts have investigated methods to moderate the distributional impact of PCT through compensatory measures, no alternative method for allocating emissions rights has yet been developed.

This paper draws upon multiple disciplines, including architecture and engineering, social policy and political theory to propose an alternative to the equal-per-capita method: Household Carbon Allocation (HCA).

The paper will present the theoretical framework behind an allocation method based method based on household size and resulting allocations will be compared to those under EPCA. This research has implications for the political feasibility of PCT schemes and has wider implications for policies aimed at the regulation of emissions from dwellings.

Dr. Christophe Rynikiewicz, SPRU, University of Sussex

Poster title: The SAIL project and hybrid sailing technology roadmap: Investigating the determining factors of hybrid sailing re-emergence in the transition to a low carbon economy

Authors: Rynikiewicz C., Jaouannet K. and Bonduelle A.

Biography:

DR RYNIKIEWICZ is an engineer and energy economist who has been involved in investigating the conditions and speed of adoption and diffusion of new radical innovation (ULCOS for steelmaking) and quantified energy foresight, including use of models (POLES, LEAP, Markal). He is a visiting fellow at SPRU, University of Sussex and working as an independent consultant on low carbon transitions.

KATELL JAOUANNET is a consulting engineer in energy and environment. After a project in the Champagne industry aiming at reducing building energy consumption, she joined

Capgemini Consulting, a global strategy and transformation consulting firm to advise and support enterprises from the energy sector in significant transformation. She there conducted a Bilan Carbone®, participated to the development of smart grid projects in France… She now focuses on developing models for territorial politics for the E&E consultant company.

ANTOINE BONDUELLE is a consulting engineer in energy and environment. In 2005, he founded E&E consultant, a small firm dedicated to supply reports and modeling in the Energy & Environment fields, to cities and public bodies, to private firms and to NGOs. He has 25 years of experience following energy technologies, first as an editor in various technology and science publications, then as a consultant. He still chronicles on science and technology for climate change professional publications such as “l’Usine à GES”. He has also been working for quite a while on the future shape of electricity production and transmission in France and in Europe. For this purpose, he developed the ELFIN model (Electricity Financing) to simulate the complexities of the electric grid and thus quantify costs and possible evolutions of electric systems. All his activities enable him to have a good watch of technology and economic issues, on the science and politics of climate change, on the legal and social evolutions of issues.

Abstract:

There is a growing recognition that radical GhG emissions cuts require shipping industry to engage in pathways to Low Carbon Shipping, therefore reducing local and global emissions. However, a range of research looking at technological learning an innovation systems perspective shows that incumbent fossil fuel technologies are likely to experience cost reductions under certain circumstances, through ‘sailing ship’ effect.

This paper deals with the conditions of the “re-transition” from steamships to (hybrid) sailing technologies. This concept includes recent advances such as fixed wings, kites but also use of biogas or electricity.

Firstly, we build on the marginal abatement curves published listing the different technological options differentiating incremental and disruptive innovations. Several studies demonstrate that CO_2 emissions by 2030 can be reduced by 30% below baseline in a cost-effective way, and by almost 60% if all the identified measures are included. We focus on costs and risks of lock in. Associated infrastructure development (natural gas, electricity and OPS, biogas, biodiesel) is not considered here.

Secondly, we report on radical initiatives of hybrid sailing which are not often considered and discuss their relevance both for short or long distance freight transport.

In the third part of the paper, we present the methodology and initial results of the hybrid sailing foresight exercise conducted in the S@IL project (Sustainable @pproaches & Innovative Liaisons).

We finally discuss how much a change in the overall demand of transported goods and new hybrid sailing concepts could substantially contribute to the transition to a low carbon economy.

Jalel Sager, Energy and Resources Group, University of California-Berkeley

Poster title: The political economy of 350ppm: Monetary-energy regimes, democracy, and climate change

Biography:

After six years spent developing a successful freelance writing business, Jalel Sager turned his attention toward sustainability, focusing on climate change mitigation and adaptation. In 2007 he founded the Vietnam Green Building Council (VGBC), now the nation's leading green building organization, serving as its executive director until 2009. That year he entered the PhD program at the University of California-Berkeley's Energy and Resources Group, where he focuses on the political economy of energy and climate change. Jalel Sager has worked as a graduate instructor at UC-Berkeley, designing and teaching a two-credit class on energy and ecological economics. He has given numerous guest lectures for Berkeley classes on energy politics, history, and the economics of 350 ppm. He continues to serve as a VGBC board member and as the international coordinator for Green Cities Fund, an international non-governmental organization and parent of VGBC. Since 2009 he has also been the US correspondent for FuturArc magazine ("The Voice of Green Architecture in Asia"). He is the author of several peer-reviewed journal articles on climate change mitigation and numerous related magazine articles. Jalel Sager is a recipient of the National Science Foundation's Graduate Research Fellowship; a US Foreign Language and Area Studies fellowship; and a National Merit scholarship. He earned a Masters' degree in 2011 and did his undergraduate work at New York University's Gallatin School.

Abstract:

We live in an ordered global system. Our project begins with the idea that linked flows of capital and energy play a major role in structuring it. These international flows—often mediated by entities such as firms or multilateral organizations—do this partly by altering domestic production and financial conditions, which then influence the relative positions of social groups (internally) and entire nations (externally). Schematically this resembles an ecosystem: emergent *linked* monetary and energy regimes demonstrate varying flow patterns that interact in a reciprocal manner with entities in the global system, producing feedbacks. The deep connections between monetary/financial policy, democracy, and energy pathways provide an opportunity. If energy and monetary systems are a linked regime, as we claim, then large-scale policies to address climate change may also improve stability, equity, and democratic control. We hypothesize that the reverse would also hold: more stable and equitable international monetary and energy regimes, undergirded by strengthened democracies, may make lower-end carbon dioxide concentration targets, such as 350 or 450 parts per million, possible.

Daniel Scharf, Pause.forThought and GreenSpeed

Poster title: Triggering transport's virtuous circle

Biography:

I am a Chartered Town and Country Planner currently being employed by a law firm, but also having worked in the public and voluntary sectors. I teach planning at the Oxford

University Department of Continuing Education. I am concerned about the role that personal mobility plays in the way we conduct our lives and develop both town and country. When coaches were speed limited to 60mph and the enforcement of the motorway speed limit for cars remained at 85mph I set up GreenSpeed to campaign to reverse this position to the competitive advantage of low carbon modes (including the train – without the high speed version). The campaign for a lower national speed limit has been accompanied by the distribution of 20>55> bumper stickers to indicate to the driver behind that a car is deliberately being driven at a responsible speed. I research and promote ways in which the planning system could and should be enabling the development of low carbon lifestyles and economies, including local food systems, climate jobs and co-housing.

Abstract:

Transport systems are responsible for a substantial proportion of carbon emissions and, in terms of personal mobility, most of these emissions are attributable to cars powered by internal combustion engines. The impact of all transport systems is a combination of and interaction between the volume, mix and speed of the constituent vehicles. Speed is the most susceptible to influence and a lower maximum speed for cars (immediately and at no cost) could have a substantial impact on volume, mix (ie modal shift) and overall carbon emissions.

The necessary radical and rapid penetration of low carbon vehicles would result from the introduction of a lower national speed limit. This is a systemic change, part of a virtuous circle, applicable across the globe, that includes mutually reinforcing changes; shift to electric vehicles, more use of public transport (trains and buses and coaches that would not be made subject to the lower limit), walking and cycling, lower congestion, and lower motoring expenditure on petrol and maintenance/replacement due to RTAs, without the rebound effect of increased usage due to the 'constant time budget'.

Driving slower would be a behavioural change welcomed by many (especially women drivers) and would reduce carbon emissions from cars by about 30% before the consequent transformational effects have developed throughout the transport system. The Environmental Audit Committee has pointed out that the lowering of the national speed limit would have the distinct advantage of helping, '…raise awareness of climate change and the need for everyone to take action on it.'(*Reducing Carbon Emissions from Transport 2006*)

Ed Sears, University of Exeter and Permaculture Association

Poster title: A social learning organisation evolves a research capability in order to study itself

Authors: E. Sears, C. Warburton-Brown, T. Remiarz and R. Sass Ferguson

Biography:

ED SEARS is an honorary member of the Earth System Science group at Exeter University with a remit to develop a published evidence base for permaculture, and chairs the Research Advisory Board of the Permaculture Association. He is a director of the Permaculture Association, Plants For A Future, Earth Heart Housing Co-operative, and T4

Sustainability Ltd, where he is responsible for designing, sourcing, marketing and installing renewable energy systems.

DR CHRIS WARBURTON-BROWN is research co-ordinator of the Permaculture Association. He gained his doctorate from the University of Glasgow, with a thesis on the financial circumstances of mothers in lower income working families.

THOMAS REMIARZ is ex-chair of the Board of Trustees of the Permaculture Association, and a member of the Research Advisory Board, responsible for developing member trials. He is an experienced permaculture designer, teacher and practitioner.

RAFTER SASS FERGUSON is a PhD student in Crop Science at the University of Illinois, whose thesis involves visiting and documenting permaculture farms in the US. He holds an MS in Plant and Soil Science from the University of Vermont.

Abstract:

Permaculture is an approach to designing sustainable human ecosystems and a collection of practitioners implementing that approach. It is rooted in systems design theory, but from the outset in the 1970s, the originators had an ambivalent relationship with the scientific community, and the most frequent criticism of the concept is that it lacks a published evidence base. This presentation elaborates the evolution of a research capability within the permaculture network, drawing inspiration from ornithology, Viable Systems Model, industrial ecology, Pattern Language and symbiogenesis.

The method used was to create a working example of a research ecosystem, operate it in real time, test its functionality through trial runs, observe baseline indicators as well as system-level behaviour, and review and amend the system cyclically to optimise performance. Data collected include practitioner information, site locations, biological indicators, assessments of community, intangible and system-level yields, and carbon footprints. We will present quantitative results on international distribution of practitioners and sites from surveys, annual and perennial polyculture yields from field trials, and carbon footprints from permaculture diploma students. The current status, components and performance of the research ecosystem will be reported.

Discussion benchmarks permaculture against other social learning organisations and design systems, and explores network and system-level indicators and the challenge of measuring impacts including the birth of the Transition Town concept during the development of an Energy Descent Action Plan on a Permaculture Design Course and involvement in Cuba's rapid decarbonisation after the end of Soviet oil imports.

Dr. Richard Twine, University of Glasgow

Poster title: Achieving low meat/dairy consumption through vegan practice

Biography:

Dr Richard Twine is a sociologist and in 2013 was Lord Kelvin Adam Smith Research Fellow at the University of Glasgow. His current research explores how to change food habits in the

context of climate change. He was previously a researcher for 10 years at Lancaster University for the ESRC Centre for Economic and Social Aspects of Genomics. He is the author of the book *Animals as Biotechnology – Ethics, Sustainability and Critical Animal Studies* (Earthscan/Routledge, 2010), and co-editor, with Nik Taylor, of The Rise of Critical Animal Studies – From the Margins to the Centre (Routledge, 2014) as well as papers on the animal-industrial complex, antibiotics, ecofeminism, posthumanism, bioethics and physiognomy. He is on the Board of Directors of the Minding Animals Organisation (http://mindinganimalsinternational.wordpress.com). For more on his research see www.richardtwine.com

Abstract:

Responding to the many reports and journal articles which have argued that a reduction in meat/dairy consumption, especially by relatively privileged populations in the global North and West, can contribute to the mitigation of GHGs (and a whole series of other public health and ecological problems), this poster argues that a practical roadmap to achieving this change involves social policies that encourage the emergence of vegan practice. Thus a discourse of 'reduction' should not be taken as ideologically opposed to 'replacement', rather the latter provides a practical means by which the social norm of the centrality of meat/dairy consumption can be contested, so that the majority of the (UK) population have more opportunities to eat a plant based diet more of the time. This poster adopts a practice theory approach to sustainable food transitions arguing that an active integration of competency, materials and meanings is vital to the continued normalisation of plant based eating. Drawing upon preliminary analysis of qualitative interviews with UK vegans this poster outlines key features of vegan transition, particular social sites of importance (supermarkets, the workplace) and policies necessary to aid this transition. Although promoting greater vegan practice certainly represents a radical questioning of a highly entrenched social norm, it directly redresses our relationship to the more-than-human and would yield significant co-benefits in environmental and public health.

Xinfang Wang, Tyndall Manchester

Poster title: Radical transition: Exploration the role of high-emitters

Authors: Xinfang Wang, Carly McLachlan and Kevin Anderson

Biography:

XINFANG WANG is a PhD researcher in the Tyndall Centre for Climate Change Research in the University of Manchester. Her PhD project is entitled "Distributional Impacts on Carbon Mitigation Policies". This research will assess the potential for such segmentation to assist in the delivery of a more effective, efficient and equitable low carbon society. The aim of this research project is to develop a suite of tailored low-carbon policy options, focused on consumption and behaviour rather than the traditional and dominant production approach. In addition, the research will consider the role of high emission groups as potential 'early adopters' of technological and behavioural innovations, which will then aid rapid diffusion through other groups. Xinfang was a research assistant on the 'High Emitters' project in the Tyndall Centre in University of East Anglia. She also had half a year working experience as an energy analysis assistant in energy consulting company in the UK. She completed an MSc in Finance and Economics with a Distinction award in the University of Southampton

and a BSc in Statistics. She is also affiliate of the Association of Chartered Certified Accountants and has one year lecturing experience in Corporation Law.

Abstract:

Climate change is a global problem that will affect every country and each individual. International negotiations have agreed to 'hold the increase in global temperature below 2 degree Celsius' (Copenhagen Accord, 2009). To meet the objective on an equitable basis, many emission reduction pathways assume that the industrialised nations reduce their emissions immediately while the poorer, non-industrialised nations increase their emissions, but at a reduced rate, peaking in next decade. However, similar discrepancies in terms of wealth, wellbeing and emissions also exist at an intra-national level. To illustrate this, the poster presents an analysis of the types of activities undertaken and related emissions profiles across different groups within the UK. The emissions are estimated through consumption-based accounting, which includes embedded and direct energy emissions due to imports, but excludes those from exported products and services. The poster will present analysis of the potential for 'high-emitting' groups to radically reduce their emissions imminently by early adoption of technological and behavioural innovations. Applying qualitative methods, it will also consider the wider impact that this could have through diffusion effects on emissions from other groups. Areas for future research will be identified, including rebound effects and distributional impacts of carbon mitigation policy.

Dr. Rachel Warren, Tyndall Centre, UEA

Poster title: The AVOID programme's new simulations of the global benefits of stringent climate change mitigation

Authors: Warren, R., Lowe. J. A., Arnell, N.W., Hope, C, Berry, P., Brown, S., Gambhir, A., Gosling, S.N., Nicholls, R.J., O'Hanley, J., Osborn, T.J., Osborne, T., Price, J., Raper, S.C.B., Rose and G. Vanderwal, J.

Biography:

Rachel Warren is a Reader in Integrated Assessment of Climate Change at the Tyndall Centre in the School of Environmental Sciences at the University of East Anglia where she leads the Community Integrated Assessment System (CIAS) team. She is Coordinating lead author of the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report, specializing in key vulnerabilities, long term aspects of mitigation, and climate change impacts especially those upon natural ecosystems. She is co-chair elect of the IPCC Task Group on Data and Scenarios for Climate Impacts Assessment (TGICA). She has over 50 peer-reviewed publications and has produced 40 reports to EU or UK government stakeholders. She led a key assessment for the UK Stern Review, and a major workstream of the AVOIDing dangerous climate change project for DEFRA to assist the UK government in its preparations for the UN Framework Convention on Climate Change Conference of the Parties in Copenhagen in December 2009. Since 2009 she has held as PI or Co-I £2.5m of funds. Previously she linked science and policy in the fields of stratospheric ozone and air pollution. At the NOAA Environmental Research Laboratories her work provided key evidence on the environmental acceptability of many CFC substitutes, and led to the inclusion of fluorocarbons in the Kyoto Protocol, winning the NOAA Aeronomy Laboratories Outstanding Scientific Paper Award. At Imperial College, her integrated modelling work was

used in the development of international UN ECE protocols and to underpin the position of the UK during these negotiations.

Abstract:

Quantitative simulations of the global-scale benefits of climate change mitigation are presented, using a harmonised, self-consistent approach based on a single set of climate change scenarios. The approach draws on a synthesis of output from both physically-based and economics-based models, and incorporates uncertainty analyses. Previous studies have projected global and regional climate change and its impacts over the 21st century but have generally focused on analysis of business-as-usual scenarios, with no explicit mitigation policy included. This study finds that both the economics-based and physically-based models indicate that early, stringent mitigation would avoid a large proportion of the impacts of climate change projected for the 2080s. However, it also shows that not all the impacts can now be avoided, so that adaptation would also therefore be needed to avoid some of the potential damage. Delay in mitigation substantially reduces the percentage of impacts that can be avoided, providing strong new quantitative evidence for the need for stringent and prompt global mitigation action on greenhouse gas emissions, combined with effective adaptation, if large, widespread climate change impacts are to be avoided. Energy technology models suggest that such stringent and prompt mitigation action is technologically feasible, although the estimated costs vary depending on the specific modelling approach and assumptions.

Jon Weiss, Lake Climate Group LLC

Poster title: Lake Climate Group LLC

Biography:

Professional Background:
For ten years I worked in-and-around the U.S. Federal Government:
1997-2000: Legislative Assistant, U.S. House of Representatives
2001-2004: Legislative Assistant (Civil Servant), Office of General Counsel, Department of the U.S. Treasury
2004-2007: Director of Strategic Initiatives, Office of Government, Community and Public Affairs at Johns Hopkins Institutions
2011-Present: Founding Executive Director, Lake Climate Group LLC *A Global Climate Change Policy and Finance organization*

Academic Background:
1993-1996: B.A., International Studies, The City College of New York (CCNY) Senior Thesis: Commercialization of China's People's Liberation Army
2008-2010: MSc., Global Politics Programme, The London School of Economics and Political Science (LSE)
2010 Dissertation: "Global Politics of Carbon Markets - Creation and Operation of Emissions Trading Schemes in the United States and European Union: How do private and public sector mobilization efforts affect the development of carbon trading markets?"

Abstract:

Established in 2011, Lake Climate Group LLC is dedicated to creating an institutionally demand-driven climate finance model called the Climate Investment Partnership (CLIP).

Near-term aspirations will demonstrate how radically fast planetary decarbonization can occur! By linking global sustainability needs with local environmental, economic and governance ambitions -- i.e., between the industrialized U.S. State of Minnesota (MN) and developing country of Costa Rica (CR) -- CLIP will show how an institutionally demand-driven model can be locally replicated and globally scaled. By harnessing the power of policy-driven finance and progressing this between developed and developing countries, CLIP can demonstrate that a sustainably integrative means exists for helping to quickly address Earth's global climate crises.

Specifically, this emerging bi-lateral model can be created because of mutually reinforcing socio-economic forces: 1) CR's renewable energy production capabilities and climate finance expertise, existing alongside their NAMAs and evolving carbon market in supporting stated national carbon neutral ambitions for 2021, and; 2) MN's dedicated financial resources, certain to be spent on a framework of public policy 'priorities and preferences'. In broader terms this CLIP will lead to creation of an investment worthy portfolio of renewable energy projects in CR, which in turn will allow for environmental market utilization of the trading of carbon as a commodity that results from the de-carbonization process, to produce, at least, a minimum ROI for both MN and CR. Thusly, CLIP could serve as a bi-lateral climate finance model that proves the possibility already exists to quickly facilitate evergreen global socio-economic sustainability.

Dr. Richard Wood, NTNU

Poster title: Modelling Sustainable Consumption and Production – Implications of a BlueMap world

Authors: Richard Wood, Thomas Gibon, Edgar Hertwich and Joe Bergesen

Biography:

Richard Wood is a Senior Researcher at the Industrial Ecology Program at NTNU, Norway. He has focused on consumption based accounting measures, with a strong background in environmentally-extended input-output analysis. He has focused on a broad range of sustainability measures, including investigating greenhouse gas emissions embodied in consumption and trade; ecological footprint analysis; material flow analysis; energy use and triple bottom line accounting. Richard has been one of the central developers of the EXIOBASE multi-regional input-output models (EXIOPOL and CREEA). In EXIOPOL he has focussed on utilising large-scale mathematical techniques to handle and optimise large datasets, the end result being a set of disaggregated and harmonised input-output tables across the world. In CREEA he is leading the EE-MRIO development. Richard has also worked on life-cycle assessment – focusing a similar set of applications on individual technologies and products. In and EU FP7 projeect "PROSUITE" he is focussing on applying hybrid IO-LCA techniques to look at the sustainability of emerging technologies. Richard has completed his PhD at the University of Sydney in 2008 under Manfred Lenzen. His PhD looked at investigating the environmental implications of structural change in the Australian economy. He has had experience and published papers on time-series analysis; structural decomposition analysis; structural path analysis; indexing techniques; optimisation

techniques; methods for handling large data sets; LCA methods; and indicator development – alongside many application focused papers.

Abstract:

Ambitious development goals have been set that accommodate projected population growth, increases in quality of life whilst limiting or even reducing impacts on natural ecosystems. As such, we expect to see major changes in technology as well as consumption habits, particularly in energy and resource intensive sectors, and those sectors associated with high greenhouse gas emissions. The large-scale deployment of low-carbon electricity production technologies is expected to substantially cut global greenhouse gas emissions. Simultaneously, efforts focused on industrial and end-use energy efficiency, on energy transmission, on storage, and energy use in buildings will also decrease the pace of growth in greenhouse gas emissions.

Against this backdrop of radical change, we will see indirect effects flow on through the economy – for all goods and services and across all regions of the world. Hence in this work, we implement a range of scenario parameters, mainly based on the IEA BlueMap scenario, into a forecasted multi-regional input-output (MRO) model. The BlueMap scenario provides one of the more radical mainstream scenarios for the energy system. By investigating it through an environmentally-extended MRIO, we are able to focus results on 2 main areas here. 1) the flow-on impact on other environmental and economic requirements (land, water, metal depletion, labour, etc); 2) the impact on consumer goods and services (investigating changes in both price and embodied environmental impact, consistent with consumption based accounting) – with flow on effects to likely changes in consumer behaviour.

A/Prof. Dr. Zhen Zhang, Fudan University

Poster title: A study on carbon lock-in in housing

Authors: Zhang Zhen, Gao Ran and Chen Hongmin

Biography:

ZHANG ZHEN: PhD, associated professor, researcher of Fudan Tyndall Centre. Research interest: high carbon emission group in everyday life, carbon lock-in in life style. Research methods: case study, survey.

GAO RAN: Graduate student in environmental management, Fudan University.

CHEN HONGMIN: PhD, Lecturer, researcher of Fudan Tyndall Centre. Research interest: high carbon emission group in everyday life, indirect carbon emission in everyday life. Research methods: input-output analysis.

Abstract:

In Today's China, energy conservation in the areas of life is being ignored. Many people are optimistic that behaviour change can effectively reduce carbon emission in everyday life. This paper argues that if there is carbon lock-in in the areas of life the contribution of

behaviour change is very limited. In order to explore the effect of carbon lock-in in everyday life, this paper focuses on the relationship between the size of house and energy using. To vividly illustrate the effect of carbon lock-in in housing, this paper compared two typical size of housing, that is, 30m2 per capita and 200m2 per capita and found that the electrical equipments are different. The bigger and more energy-consuming equipments are stuffed in large houses. Once those devices are acquired the effect of carbon reduction from behaviour changing is almost negligible. Therefore, to avoid being locked in by bigger houses is a question worthy of study. In essence, it is a how to provide Chinese a new style of life which is both comfort and carbon saving.