

University of Huddersfield Repository

Ali, Jafar, Fieldhouse, John D. and Talbot, Chris J.

The study of cooling water discharge into British Waterways canal

Original Citation

Ali, Jafar, Fieldhouse, John D. and Talbot, Chris J. (2011) The study of cooling water discharge into British Waterways canal. In: Sustainable Futures | Where we want to be and how we get there, 30th–31st March, 2011, University of Manchester, Manchester, UK. (Unpublished)

This version is available at http://eprints.hud.ac.uk/id/eprint/10118/

The University Repository is a digital collection of the research output of the University, available on Open Access. Copyright and Moral Rights for the items on this site are retained by the individual author and/or other copyright owners. Users may access full items free of charge; copies of full text items generally can be reproduced, displayed or performed and given to third parties in any format or medium for personal research or study, educational or not-for-profit purposes without prior permission or charge, provided:

- The authors, title and full bibliographic details is credited in any copy;
- A hyperlink and/or URL is included for the original metadata page; and
- The content is not changed in any way.

For more information, including our policy and submission procedure, please contact the Repository Team at: E.mailbox@hud.ac.uk.

http://eprints.hud.ac.uk/

Introduction	3
Conference Venues and Emergency Contacts	4
Programme of Events	5
Keynote Speaker Biographies	8
Expert Panel Biographies	9
Presentation Abstracts and Presenter Biographies	10
Poster Abstracts	31
Voting Card	47

In the following pages you will find information to help you get the most out of what should be an engaging and thought-provoking two days of presentations and debate.

The conference aims to foster new ways of thinking by bringing together physical scientists, social scientists and engineers to discuss

- alternative ways of envisioning and pursuing a 'sustainable future'
- the changes to our current structures and paradigms that might be needed to cross the divide between 'where we need to be' and where we are headed
- how our work as researchers may affect that future

Without imposing a limitation on what is or is not considered 'sustainable', it is clear that the energy-hungry lifestyles of rich, industrialised nations are increasingly in tension with the evidence on climate change, the peaking of conventional oil production and the needs of industrialising nations to increase their basic levels of consumption. A 'one size fits all' solution seems unlikely, so a key aim of the conference is to consider what different visions of the future may look like for different regions and population groups. Rather than simply retreading previous work on the subject of 'what needs to be done', the conference will explore whether existing ways of thinking and acting may be constraining the futures we wish for, and whether as researchers we have a special role to play in steering a new agenda.

We hope that you will find the next two days mentally challenging, possibly exhausting, but also hopefully very rewarding.

Wishing you an enjoyable and stimulating conference,

The organising committee

The Sustainable Futures Conference 2011 was made possible by the kind support of the following bodies:





The University of Manchester Sustainable Consumption Institute

MANCHESTER

Faculty of Engineering and Physical Sciences



Faculty of Humanities

The University of Manchester Manchester Business School



Conference Venues and Emergency Contacts

Conference Venue Room 2.42 Manchester Business School West The University of Manchester Booth Street West M15 6PB Manchester

Dinner Venue Zouk Teabar and Grill Unit 5, The Quadrangle Chester Street M1 5QS Manchester



<u>Conference committee emergency numbers:</u> Christopher Jones 07811121847; Dan Calverley 07790391220

4

Programme of Events

Sustainable Futures: Where we want to be and how we get there

Tyndall-SCI PhD conference, 30th–31st March, 2011, Manchester, Manchester Business School (West)

Day 1 (Wednesday 30th March)

08:30-09:00 - Registration and Coffee - Alumni Common Room

09:00-10:30 - Opening remarks, keynote plenary and discussion - Room 2.42

Opening remarks by *Prof Alistair Ulph*, acting director of the Sustainable Consumption Institute, former vicepresident and dean of the Faculty of Humanities, University of Manchester

Questions to be discussed by the speakers:

Is there a disparity between stated climate change goals and the measures taken to achieve them? If this is the case, how can it be resolved? How can we realign our efforts with what we need to do as societies in order to avoid dangerous climate change and exploitation of the Earth's resources?

Speakers:

- Paul Ekins, Professor of Energy and Environment Policy at the University College London Energy Institute, codirector of the UK Energy Research Centre
- Andy Gouldson, Professor of Sustainability Research; director of the ESRC Centre for Climate Change Economics and Policy
- Andrew Simms, founder of the climate change, energy and interdependence programmes at nef (the new economics foundation), former policy director at nef
- *Alice Bows,* lecturer in energy and climate change in the School of Earth Atmospheric and Environmental Sciences, Sustainable Consumption Institute; University of Manchester

10:30-11:30 - First presentation session (theme: built environment) - Room 2.42

Three PhD speakers give a 10 min talk / presentation, each followed by a 5 min individual Q&A session, followed by a 15 min general discussion at the end. Other presentation sessions will follow the same format.

Presentations and discussion:

Innovative finance and delivering the low-carbon built environment; localism and planning; sustainable infrastructure futures

11:30-12:00 - Coffee - Alumni Common Room

12:00-13:00 - Second presentation session (theme: behaviour) - Room 2.42

Presentations and discussion:

Scientific engagement and scepticism; motivating low-carbon behaviours; travel transitions

13:00-13:45 – Lunch - Alumni Common Room

13:45-15:15 - Knowledge cafe - Room 2.40 and 3.10

The Knowledge Cafe participants, in groups with facilitators, explore topics of mutual interest, share ideas and learn from each other. Knowledge Cafe topics include but are not limited to: research impacts, methods and methodologies, outputs to outcomes (informing policy), qualitative vs. quantitative issues.

15:15-15:45 - Coffee - Alumni Common Room

15:45-17:00 - Knowledge cafe highlights - Room 2.42

Knowledge cafe facilitators report highlights of the discussions at their tables to the plenary followed by a general discussion.

17:00-18:00 - Third presentation session (theme: governance and industrialised countries) - Room 2.42

Presentations and discussion:

Aviation policymaking; product labelling for sustainable production and consumption; participatory emissions budgets

19:00 – Dinner - Zouk Teabar and Grill (Unit 5, The Quadrangle, Chester Street, M1 5QS Manchester)

Day 2 (Thursday 31st March)

08.30-09:00 - Coffee - Alumni Common Room

09:00-09:10 - Introduction to day - Room 2.42

09:10-10:10 - Fourth presentation session (theme: impacts and resilience) - Room 2.42

Presentations and discussion: Climate change induced extreme weather events; ecosystems services and urban resilience; migration decisions

10:10-11:10 - Fifth presentation session (theme: energy) - Room 2.42

Presentations and discussion on: Biomass energy & community issues; nuclear district heating; sustainable energy for development in desert regions

11:10-11:40 - Coffee - Alumni Common Room

11:40-12:40 - Sixth presentation session (theme: governance and developing countries) - Room 2.42

Presentations and discussion: REDD plus (reducing emissions from deforestation and degradation); water resource conflicts; biofuels vs. Food

12:40-13:30 - Lunch - Alumni Common Room

13:30-14:30 - Seventh presentation session (theme: methods for modelling the transition) - Room 2.42

Presentations and discussion: Assessing interdependence of critical infrastructure; optimising renewable energy deployment; multi-stakeholder participatory scenario generation

14:30-14:45 - Coffee - Alumni Common Room

14:45-15:00 – Video address from *Libo Wu* – Professor at the Centre for Economics & Strategy Studies of Fudan University, China - *Room 2.42*

15:00-16:30 – Question Time with expert panel - Room 2.42

A panel of academics, business people and campaigners discuss the main theme of the conference (sustainable futures: where we want to be and how we get there), with brief statements followed by a chaired *Question Time* type Q&A with the conference audience.

Panellists:

- Molly Conisbee, director of communications and campaigns at the Soil Association
- Stephen Heal, consultant, former head of climate change at Tesco
- *Colin Challen,* climate change campaigner, former Labour MP (2001–2010), founder member of the All Party Parliamentary Group on Climate Change
- *Kevin Anderson*, professor of energy and climate change, University of Manchester (Mechanical, Civil and Aeronautical Engineering), deputy director Tyndall Centre
- *Nick Pidgeon*, professor of environmental psychology, director of the Understanding Risk research group at Cardiff University

16:30 - 16:45 Prize for best presentation and closing remarks - Room 2.42

Alice Bows is a senior researcher and lecturer in the School of Earth Atmospheric and Environmental Sciences, the Sustainable Consumption Institute (SCI), and the Tyndall Centre in the University of Manchester. Alice trained as an astrophysicist at the University of Leeds, making the transition into climate change through her PhD in climate modelling at Imperial College, London. After her PhD she worked in science communication, returning to academia in 2003 when she joined the Tyndall Centre at the University of Manchester to research conflicts between the UK's climate change and aviation policies and develop energy system scenarios. Alice leads the University of Manchester's Aerospace Research Institute's (UMARI) Environment theme, and the Sustainable Consumption Institute's Climate Change and Carbon theme. Also, she currently leads on the SCI Flagship Project on Mitigation and Adaptation Scenarios, and is the PI on the EPSRC Project *the High Seas*, investigating the potential of decarbonising shipping. Alice is co-author of *Decarbonising the UK: Energy for a Climate Conscious Future* (2005).

Paul Ekins is Professor of Energy and Environment Policy at the UCL Energy Institute, and a Co-Director of the UK Energy Research Centre, in charge of its Energy Systems theme. His academic work focuses on the conditions and policies for achieving an environmentally sustainable economy, with a special focus on energy and climate policy, and the modelling of the energy system; on innovation; on the role of economic instruments such as environmental taxes; on sustainability assessment; on environment and trade; and recently on energy and the built environment. He was Founder and Associate Director of the sustainable development charity Forum for the Future, and has been a specialist adviser to the Environmental Audit Committee of the House of Commons (1997-2005) and a Member of the Royal Commission on Environmental Pollution (2002-2008). In 1994 Paul Ekins received a Global 500 Award 'for outstanding environmental achievement' from the United Nations Environment Programme. He is the author of numerous books, papers and articles including Economic Growth and Environmental Sustainability: the Prospects for Green Growth (Routledge, London, 2000), and is co-editor of the book Understanding the Costs of Environmental Regulation in Europe (Edward Elgar, Cheltenham, 2009).

Andy Gouldson is professor of sustainability research at the University of Leeds, and a Director of the ESRC Centre for Climate Change Economics and Policy. He has been a visiting professor at the University of Hong Kong for the last 7 years, and was Director of the Sustainability Research Institute, at the University of Leeds. Andy is an interdisciplinary environmental social scientist whose work combines aspects of geography and environment, politics and policy, economics and management and science and technology studies. His main area of expertise relates to the influence of different forms of policy and governance on businesses, on economic development and on the relationships between environment, economy and society. He has also worked extensively on the management of environmental risks and on theories of ecological modernisation and environmental justice. Much of his work has focused on issues relating to air pollution, and more recently he has focused on the management of the risks associated with climate change and on enhancing the prospects for a transition towards a low carbon economy. Throughout his career, he has worked closely with government, regulatory agencies, businesses, pressure groups and local communities.

Andrew Simms founded the climate change, energy and interdependence programmes at **nef** (the new economics foundation), where he was a policy director until the end of 2010. For many years he has been a productive thinker and writer on climate change, economy, and other related topics. He coined the concept of "ecological debt", and was behind the *onehundredmonths.org* initiative which is counting down the time left for action before the world enters a new more perilous phase of global warming. Andrew regularly writes for the national press and counts down the months himself in a column in the guardian's comment is free. He is the author of several books, including *Ecological Debt: Global Warming and the Wealth of Nations (2009), Tescopoly: How One Shop Came Out on Top and Why it Matters (2007); Eminent Corporations: the Rise and Fall of the Great British Corporation(2010, co-author). He is on the boards of Greenpeace UK, the climate campaign 10:10* and The Energy and Resources Institute Europe.

Kevin Anderson holds a Chair in Energy and Climate Change at the School of Mechanical, Aerospace and Civil Engineering at the University of Manchester from where he leads the Tyndall Centre's energy and emissions-related research. He is former Acting Director of the Tyndall Centre. In addition to Kevin's academic work, he is regularly called on to give advice to Government and Industry stakeholders, as well as to contribute to wider public and policy fora on climate change. Kevin is a qualified marine engineer and has 12 years industrial experience, principally in the petrochemical industry. He is currently a non-executive director of Greenstone Carbon Management – a London based company advising leading firms and public bodies on how to manage their carbon emissions and is commissioner on the Welsh Assembly Government's 'Climate Change Committee'.

Colin Challen was born in Scarborough, UK, and has lived and worked in Yorkshire all his life, except for a period in his first job in the RAF. He has spent the last 25 years actively engaged in politics, mainly Labour Party politics. He served as a Councillor on Hull City Council from 1986 to 1994, was a Labour Party Organiser from 1995 to 2000 and from 2001 to 2010 he was the Labour MP for the constituency of Morley and Rothwell. In 2005 he founded the All Party Parliamentary Climate Change Group - which became one of the largest groups in Westminster. According to the Independent, he has taken up climate change more vigorously than any other MP.

Molly Conisbee is the director of campaigns and communications at the Soil Association, that promotes planetfriendly food and farming. In 2008, she joined team Soil from the Arts and Humanities Research Council, where she was director of communications and before that she did time with the new economics foundation, the Association of London Government and the Labour Party among others. She also contributes to the Soil Association blog. When not campaigning and communicating, Molly enjoys cooking, reading and fine wine, and looking after her Jack Russell, Caz.

Stephen Heal, MD Hackwood Consulting Ltd, specializes in sustainability strategies - both commercial and environmental. Stephen's interest in climate change strategies came when working as *Climate Change Director for Tesco plc*, in developing and implementing Tesco's climate change strategy including setting targets, measuring emissions and running carbon foot-printing programs, also being responsible for active engagement with suppliers and customers on the issue. Stephen has worked with the *SCl in Manchester* in support of their publication "Consumers, business and climate change". Stephen also plays an active role in the World Product Carbon Footprinting forum. Prior to Tesco, Stephen spent 7 years at *Boston Consulting Group* working with businesses as well as academic institutes across many sectors. Stephen started his career as a trader in banking and he has an MBA from INSEAD, France, a degree in Biochemistry from Cambridge University, UK. He was Advisory Board member of the Cambridge-MIT institute. Stephen also teaches corporate sustainability strategies at the Corvinus University in Budapest where he lives.

Nick Pidgeon is Professor of Environmental Psychology and Director of the Understanding Risk Research Group within the School of Psychology at Cardiff University. He works on risk, risk perception, and risk communication and as such his research is interdisciplinary at the interface of social psychology, environmental sciences, and science and technology studies. He is currently researching public responses to energy technologies (e.g. nuclear power, renewable energy), climate change risks, and climate geoengineering. In the past he has led numerous policy oriented projects on issues of public responses to environmental risk issues and on 'science in society' for UK Government Departments, the Research Councils, the Royal Society, and Charities. Nick is currently a member of the UK Department for Energy and Climate Change's Science Advisory Group (SAG), and theme leader for the Climate Change Consortium for Wales.

Libo Wu is executive director of the Centre for Economics and Strategy Studies, and deputy director of the Centre for Environmental Economics studies, both at Fudan University. She is very dynamic and leads a group of 10 PhD students, and many researchers. Her research focuses on the economic impact of climate change and on policy assessment. She has conducted extensive modelling and data analysis of the economic impact of decarbonisation using an Integrated Assessment Model for the Shanghai area.

DELIVERING THE LOW CARBON BUILT ENVIRONMENT: THE NEED FOR **INNOVATIVE MODELS OF FINANCE AND SERVICE-PROVISION**

Philip James

School of Mechanical, Aerospace and Civil Engineering, University of Manchester, Philip.James@postgrad.manchester.ac.uk

Biography

Philip is currently in the final year of study for an EngD entitled 'The Development of Decision Making Tools for the Specification of Zero Carbon Emission Construction Strategies'. His research is conducted at the University of Manchester and Clancy Consulting Ltd, a medium-sized built environment engineering consultancy. Previously he studied biology and computational biology before becoming interested in low carbon and sustainability issues and working at the now expired sustainability charity Sustainability Northwest. As well as the built environment he also has a keen layman's interest in climate science, sustainable agriculture, and Gaia theory. He also enjoys cycling, allotmenting, playing football and trying to learn Spanish.

Abstract

The UK has a policy for all new homes to be 'zero carbon' from 2016 and all new non-domestic buildings to be 'zero carbon' from 2019, with schools and other government buildings leading the way from 2016 and 2018 respectively. The European Directive on Energy Performance of Buildings calls for all new buildings to be 'near zero energy' from 2020, with new public buildings achieving this from 2018. A range of policies are also being developed in the UK to tackle the existing building stock, including the proposed Green Deal to provide finance for the retrofit of homes and businesses, and the Carbon Reduction Commitment to incentivise energy efficiency in large public and private sector organisations. Such policies aim to achieve a radical transformation of the built environment, however, the investment required to bring this about is considerable.

Traditional financial models may not be adequate (1) to attract the required investment, and (2) to deliver buildings which actually achieve their stated performance targets in-use. This presentation discusses, with reference to case studies and worked examples, how innovative financial and service-provision models can encourage the required investment in the built environment, whilst providing the incentives to ensure buildings actually achieve high performance in-use. The Green Deal is discussed and its potential to deliver widespread improvements in the existing housing stock evaluated. The UK's emerging 'zero carbon' policy with respect to new homes is discussed. The applicability of Green Deal-like finance to new buildings is explored as a means to incentivise developers to go beyond minimum regulatory requirements. An alternative to the standard energy supply model is then explored. Energy Services Companies (ESCo's) which charge the user for services supplied rather than energy consumed are discussed. The benefits of an idealised version of this model, with the ESCo involved in a building's development from the earliest stages, is explored, along with the real world constraints and difficulties of this model. Finally, a case study is used to demonstrate the advantages of ongoing relationships between suppliers and users of innovative building systems. Innovative contractual and financial arrangements are shown to ensure that the continued optimisation of system performance benefits both parties.

It is concluded that financial and service-provision models emphasising ongoing collaboration and mutually beneficial outcomes are required. By providing services at a fair and stable price, whilst incentivising energy efficiency and low carbon emissions, these models are best suited to produce the more sustainable built environment we urgently require.



Katherine Brookfield

School of Civil Engineering and the Environment University of Southampton, <u>klb2c08@soton.ac.uk</u>

Biography

Katherine is a 3rd year PhD student in the School of Civil Engineering and the Environment at the University of Southampton. Her research focuses on the relationship between planning policy and residents' quality of life. Specifically, she is exploring planning policy's approach to mixed use development and the views of tenants and residents associations towards this. Katherine's PhD is funded by an ESRC/EPSRC scholarship.

Prior to her PhD, Katherine completed a first degree in Politics at the University of Newcastle upon Tyne, where she received the John Wiseman Prize for the Best Final Honours Performance, and a Masters in Planning Research at the University of Sheffield.

Outside academia, Katherine has worked as a Research Analyst at Knight Frank in the Residential Research Team where she advised a range of public and private clients on various aspects of the residential property market and residential development. She then worked at EC Harris as a Regeneration Consultant advising on social, economic and environmental regeneration projects for clients including local authorities, developers and community groups.

Abstract

The Coalition Government claims that the concept of neighbourhood planning introduced by the Localism Bill will bring 'radical' and 'profound' changes to the planning system furnishing groups of residents with new rights and powers. Under proposals in the Bill, parish councils or neighbourhood forums will have the right to prepare development plans that will be submitted to a referendum of residents for approval. Ministers imply that residents will construct plans that are 'sustainable', 'imaginative', 'rational', 'careful' and 'kind' and that localism will place planning powers in the hands of people who 'know what they are doing'. Against this background I present findings from in-depth interviews and focus groups with planners and residents associations on urban design and planning policy. I argue that whilst planners have adopted a vision of sustainability which finds support amongst numerous policy and academic communities - e.g. mixed use, higher density development, walkable neighbourhoods, renewable technologies, socially mixed communities - residents associations favour a complex combination of more and less sustainable outcomes - e.g. lower density, traditional suburbs but solar panels and wind turbines on properties, one-to-one parking provision for city centre flats but extensive public transport. I find that groups tend to be conservative and traditional rather then innovative and imaginative in their design preferences, often wishing to replicate existing or historic development patterns. Further, groups appear to differ in their capabilities, resources and access to networks. Whilst some understood and engaged with the planning system others felt ignored and powerless. These findings perhaps raise concerns about the 'sustainability' of the outcomes that might be produced by neighbourhood planning. Residents may construct plans which encourage less sustainable development, especially as there is no apparent duty on those preparing these plans to consider climate change (unlike those preparing Local Development Frameworks). Further, a conservative design ideal could be promoted with more innovative, perhaps more sustainable, approaches rejected. In addition, whilst planners are tasked with promoting the 'public' good and balancing private interests, neighbourhood planning could result in well organised, time-rich groups of residents dominating the process, shaping plans to address their particular concerns. Communities lacking such residents might fail to prepare a plan or the views of less prominent groups could be omitted from proposals. Will these plans be the most effective way of ensuring a sustainable future for all? Neighbourhood planning will change the pathway. In this presentation I begin to question what it might mean for the destination – will it be a sustainable future for all?

ANALYSIS OF AND TRANSITION STRATEGIES FOR SUSTAINABLE INFRASTRUCTURE FUTURES

Edward Byers

School of Civil Engineering & Geosciences University of Newcastle, <u>e.a.byers@newcastle.ac.uk</u>

Biography

Edward Byers is a Civil & Environmental engineering graduate currently pursuing a PhD in infrastructure systems (EPSRC) at Newcastle University. Half Brazilian, half British, Edward has strong interests in future energy and water issues in particular and was able to focus on these when he spent a year in Sweden at Chalmers University of Technology. Edward's current research is focused on sustainable infrastructure transition strategies for the UK. This involves developing a model to analyse different infrastructure futures, in particular cross-sector interactions and systemic behaviours. He is also looking into governance arrangements and different policy options, particularly with respect to technology choice. Alongside his doctoral studies, Edward collaborates regularly with the new Infrastructure Transitions Research Consortium (ITRC) and has had recent involvement with the Engineering and Interdependency Expert Group of Infrastructure UK. His PhD supervisors are Dr Jaime Amezaga (Newcastle University) and Prof Jim Hall (University of Oxford).

Abstract

High quality civil infrastructure networks (water, energy, transport, waste and communications) are essential for supporting economic growth and for promoting social well-being. A gradual shift from autonomous infrastructure to interdependent infrastructure networks has resulted in complex interdependent systems vulnerable to widespread failure due to natural catastrophes and also long term societal and environmental change. With intensifying environmental risks and increasing *infrastructure interdependence*, strategies are needed to mitigate these risks and deliver increasingly sustainable and resilient infrastructure. As noted by a recent UK Council of Science of Technology (CST) Report the current long-term planning approach (also prevalent across the world) is highly fragmented in terms of delivery and governance, with responsibilities and accountabilities spread within Government departments, agencies and regulators and little coherence and connectivity across the system of networks. The future brings with it many other issues such as a growing and ageing population which is likely to pass 75 million by the 2050s. Along with other socio-economic drivers, the range of uncertainty with respect to future demands for infrastructure services increases considerably, exacerbated by the even less understood spatial dimension.

Whilst a number of scenarios or storylines have been developed to look at the UK's future critical infrastructure, these tend to have focused on single sectors, or have been qualitative analyses across multiple sectors. Crucially, there has been very little quantified analysis about different cross-sector configurations' performance and the inherent risks and opportunities this may present. Indeed it is probably only by exploiting cross-sector synergies that there can be a realistic prospect of approaching a future that might qualify as being sustainable.

Key to maintaining performance is the understanding of future demands against a supply base that will need to change considerably. This is complicated by the number of variables with respect to climate, demography, economy and technology, all of which vary spatially and temporally. Investigation of transition strategies not only minimises risks such as *technological lock-in* but is also likely to present opportunities to exploit feedback mechanisms otherwise forfeited by the currently fragmented approaches to infrastructure planning. Moreover, in the context of climate change, UK infrastructure is being challenged on two major fronts: laws are in place to reduce greenhouse gas emissions by 80% by 2050 whilst the need to adapt infrastructure to be more resilient to intensifying levels climate change is widely recognised.

In this presentation I will give an overview of the scenario spaces concerning different infrastructure futures governed by technological transitions and socio-economic drivers. Subsequently I will look into preliminary assessments of cross-sector interdependencies between energy, water and transport and how drivers and constraints will change this in the future. Finally, I shall outline an approach to quantifying interdependent demands and interdependent supplies to inform sustainable transition strategies.

GLOBAL WARMING AND HEATED CLIMATES IN THE BLOGOSPHERE: HOW SHOULD WE RESPOND TO THE GROWING USE OF THE INTERNET TO SEED SCIENTIFIC UNCERTAINTY?

Julie Sawyer

Dept. Social Sciences University of Loughborough, <u>j.a.sawyer@lboro.ac.uk</u>



Biography

My current research centres on understanding and facilitating the integration of citizenship, in the wider sense of the concept, with the demands of sustainability and achieving sustainable lifestyles. Critical to this work is an understanding of the complex societal contexts and overlapping economic and political infrastructures, that impact upon and shape the ways in which individuals think and act, and can lead to both sustainable and unsustainable outcomes, hence my focus on knowledge acquisition and communication. In addition to this, I am also interested in the ways in which the expanded sphere of spatial and temporal responsibility that resides at the heart of sustainable citizenship serves to destabilise traditional notions of being and belonging, by pressing the individual to stretch their citizenly imagination to encompass those living both near and far, and now and in the future. Lastly, how such citizenship is practiced in concrete moments forms a further aspect of my research, thus I have a parallel interest in alternative consumer and lifestyle networks, personal carbon accounting, and developing carbon capabilities. In particular, I am intrigued to see how such developments will impact on the inclusion/exclusion of those living with disabilities.

Abstract

Recent research into where the general public source most of their information on global warming indicates a growing role for the internet (Lockwood, 2011), although the quality of information available there is highly debateable (Gavin, 2009). In this way, the sites of adjudication in the great global warming debate have also shifted; arguments are no longer won or lost in academic circles or peer reviewed journals but in the agora of the blogosphere (Hulme, 2010). Newly published research is now rapidly consumed, digested, regurgitated, criticised and replicated by various social actors across the blogosphere according to their own particular viewpoint on the global warming debate; waiting to be discovered and debated by interested laypersons. Operating outside the confines of peer review these actors often amplify certain aspects of the research and downplay others, deliberately creating misleading impressions of scientific findings (Ladle *et al.*, 2005) with potentially negative consequences for both the public's trust in science and their motivation and willingness to act. This presentation, therefore, argues that this shift in the sites of claims-making raises new challenges and opportunities for those researching and publishing in the overlapping arenas of global warming, communication, and sustainable lifestyles.

It will be suggested that researchers can no longer publish with just their disciplinary audience in mind, but need to bear in mind that information will be culled from their work and re-used by laypersons with only a limited knowledge of their specialism. As a consequence, a review of how complex issues are framed and discussed in academic papers is urgently needed; in particular, one that focuses on how uncertainties in outcomes are discussed in light of the growing legitimacy of a plurality of perspectives on global warming. It will then be proposed that a host of opportunities for directly engaging with the public are being missed through a collective failure to make more effective use of the internet. A small number of individual scientists and academics have launched their own webpages or blogs, but at the moment these are crowded out by the huge number of other sites run by organisations, citizen-journalists and lay-scientists intent on propagating their own sceptical discourse. Therefore, it is suggested that if we wish to meaningfully engage more people in the process of making lifestyle changes, we need to give serious consideration to moving into the collaborative arena of open-source publication and direct communication with a properly promoted site involving a wide-range of specialists covering the scientific, political, economic and social aspects of global warming.

PROMOTING LOWER-CARBON LIFESTYLES: CHANGE PROCESSES AND STAGES OF CHANGE

Rachel A. Howell



Centre for the study of Environmental Change and Sustainability The University of Edinburgh, <u>r.a.howell@sms.ed.ac.uk</u>

Biography

Rachel Howell is a third year PhD student at the University of Edinburgh, researching how individuals can be encouraged and enabled to adopt lower-carbon lifestyles. Her research is interdisciplinary, combining insights particularly from psychology and sociology in an attempt to answer questions such as: what kind of communications and interventions inspire behavioural change, and what are the personal and social factors that facilitate or inhibit it? Rachel worked for several years in the voluntary sector with asylum seekers, homeless people, and women involved in prostitution, then gained an MSc in Environmental Sustainability from Edinburgh University. She was joint co-ordinator of the Living Witness project, a Quaker environmental charity promoting sustainable lifestyles, and a researcher at the Oxford University Environmental Change Institute before starting her PhD. Research interests include: lower-carbon/sustainable lifestyles, pro-environmental behaviour change, community-level carbon reduction groups, climate change communications and discourses, Personal Carbon Allowances, and education for sustainability. Follow my work at: http://edinburgh.academia.edu/RachelHowell

Abstract

A vision for the future: Individuals are responsible for a significant proportion of UK greenhouse gas emissions. In order to meet UK targets of 80% reductions from 1990 levels by 2050; low-carbon lifestyles must become the norm in future. The scale of the challenge suggests that behaviour changes will be necessary, in addition to new technologies and governance.

How might we affect that future and what changes might be needed to current behaviour change campaigns? This presentation addresses the question: are current efforts to motivate lower-carbon behaviour change suited to the audiences they achieve? It offers a model to guide design of future interventions.

The *transtheoretical model of behaviour change* outlines six *stages of change* that individuals progress through as they change their behaviour, and ten associated *processes of change*. The model, which originates from health psychology, has been developed and tested by analysing attitudes, perceptions, and behaviour of participants at different stages of many health-related programs, and has been used to design successful interventions targeting behaviour such as smoking, illegal drug use, and healthy eating.

This presentation will outline the transtheoretical model and discuss the potential for applying it to analyse and design interventions aimed at promoting lower-carbon behaviours and lifestyles. I will draw on work already completed on the impact of the climate change film *The Age of Stupid* on audience attitudes and behaviour, together with research on the experiences of members of Carbon Rationing Action Groups.

The Age of Stupid depicts the world in 2055 devastated by climate change, combining this with documentary footage which illustrates many facets of the problems of climate change and fossil-fuel dependency. My study investigated the effects of the film on UK viewers' attitudes and behaviour through a four-stage survey. The film increased concern about climate change, motivation to act, and viewers' sense of agency, although these effects had not persisted 10-14 weeks after seeing it. It had limited success in promoting mitigation actions and behavioural change. Filmgoers were atypical of the general public in that they exhibited very high levels of concern about climate change, knowledge about how to reduce their carbon emissions, and contact with organisations campaigning about climate change, before they saw the film. In terms of the transtheoretical model, they were generally at the later stages of change with regards to lower-carbon behaviours. The film, however, appealed to change processes which the model suggests would more appropriately be employed with individuals at earlier stages of change. One could say the design of the intervention did not match the audience it gained. In contrast, initial data from interviews with members of Carbon Rationing Action Groups (CRAGs) suggests that the change processes utilised by the CRAGs movement are better aligned with the stages of change that individuals were at when they joined, enabling significant behavioural changes and reductions in members' carbon footprints.

TRAVEL TRANSITIONS: A JOURNEY FROM THE PAST AND IMPLICATIONS FOR THE FUTURE (EVs)

Malek Al-Chalabi

DPhil Candidate, Transport Studies Unit / Environmental Change Institute, University of Oxford, <u>malek.alchalabi@gmail.com</u>

Biography

Malek is currently a first year doctoral student at the Environmental Change Institute and Transport Studies Unit at the University of Oxford. His interests revolve around environmental citizenship, energy behaviours, and sustainable lifestyles. Malek has advised local and national governments on climate change policy and brings experience from the Stockholm Environment Institute, Martone Construction, Groundwork Somerville, and the IMPES (Integrated Multiphase Environmental Systems) Laboratory. Malek has an MSc from Imperial College in environmental technology with an energy policy specialization and a BSc from Tufts University in civil engineering.

Abstract

Transport accounts for about a quarter of global carbon emissions and there are many initiatives in governments and organizations to decarbonise transport. One of the contemporary mechanisms that aim to decarbonise transport is the use of electric vehicles. Starting from January 2011, the UK government will subsidize select electric vehicles for 25% of the cost of the car up to a maximum amount of £5,000 per car. Other countries have similar schemes, including the USA, France, Ireland, and Portugal. With the uptake of electric vehicles, changes will take place in infrastructure, technology, charging behaviour, and travel behaviour.

The literature on electric vehicles is predominantly dominated by the technological aspects of the technology (batteries, range, infrastructure, electricity supply, etc). The socio technical literature on electric vehicles, particularly the behavioural and cultural influences on how it is perceived and used, is more limited.

This presentation will first discuss how social, cultural, and behavioural factors influenced previous travel transitions. This includes understanding the role society played in shaping travel development and how cultural norms influenced travel patterns. Case studies to be drawn from revolutionary and incremental transport changes, which include, but are not limited to: the domestication of horses, the invention and evolution of bicycle, and transitions from horse based transport to mechanical transport.

Based on a historical review of the importance of behaviour and culture with regards to travel transitions, the second part of the presentation will convey the importance of culture and society for future transitions, acknowledging the gaps in the literature, areas of current research, and indicate what may be needed for the future. The findings are important for the field of exploring environmental lifestyles, as well as having policy implications for the evaluation of low carbon (transport) policy (disaggregate level).

SUSTAINABILITY PRODUCT LABELLING: A MEAN TO SUPPORT MORE SUSTAINABLE CONSUMPTION AND PRODUCTION?

Leonie Dendler

Tyndall Centre for Climate Change Research, Sustainable Consumption Institute and Manchester Business School, University of Manchester, leonie.dendler@postgrad.mbs.ac.uk



Biography

Leonie Dendler has studied environmental science at Leuphana University Lueneburg (Germany) and Queen's University Belfast (UK) focusing on environmental management, communication and law. She has gained practical experience in the retail, waste, and research sector. Since 2008 Leonie is a PhD researcher at the Tyndall Centre for Climate Change Research and Manchester Institute of Innovation Research (Manchester Business School) and doctoral student at the Sustainable Consumption Institute (University of Manchester) working on the prospects and different visions for an effective implementation of a sustainability 'meta label' to support 'more' sustainable consumption. Leonie has published in different labelling and governance related areas, been involved in professional public service and presented parts of her research at various international conferences including the European Roundtable on Sustainable Consumption and Production, the Berlin Conference on the Human Dimensions of Global Environmental Change and the Annual International Sustainable Development Research Conference.

Abstract

Recent decades have seen an increased implementation of product labelling schemes to support more sustainable consumption and production. In line with general trends of neoliberalisation this form of governance aims to shape the production and consumption system through facilitating two main processes: increased societal demand for more sustainable products and the transformation of the supply chain into a more sustainable direction. Crucial for increasing the effectiveness of these processes is to enhance how the stakeholders shaping them perceive the legitimacy of a labelling scheme. Based on four case studies (EU eco-, EU energy, Fair Trade and MSC label) this study shows that enhancing legitimacy is a complex, interconnected and often inherently conflicting process consisting of moral, input and output related, pragmatic and cognitive dimensions; influenced by various internal and external factors.

Next to the perceived legitimacy among crucial stakeholders inferences on the overall effectiveness of a labelling scheme have to take into account indirect effects. A major indirect effect is the limited extent to which labelling schemes challenge fundamental societal structures and potentially even enforce the focus and dependence of our current societies on mass consumption of goods and resource use. Facing limited resources and most urgent needs to drastically reduce negative environmental effects like greenhouse emissions on the one and large scale growth rates of economies in countries like China and India on the other hand, more influential instruments that address overall amounts of consumption seem to be needed.

In response to this need some suggest to relate labelling schemes with more drastic measures such as rationing or environmental impact related tax reforms. So far political as well as academic debate of such ideas is lacking. Judging from the results of this study an important point to keep in mind for any such discussion is that a major factor for the legitimacy of a labelling scheme from a normative as well as pragmatic perspective is the extent to which stakeholders are included in the decision making processes. To achieve this inclusion, but also considering the complexity and often inherently conflicting sustainability agenda, decision making for example on labelling standards is rather about finding the most robust compromise between different stakeholder opinions than defining any absolute account of sustainability. Such issues raise pragmatic as well as normative questions as to what extent any labelling scheme should be used for more radical interventions, not least because finding a robust compromise is often majorly influenced by power imbalances.

PRIVILEGED ACTORS IN ENVIRONMENTAL POLICYMAKING? A CASE STUDY OF THE AVIATION INDUSTRY IN THE UK

Lauren Roffey

The University of East Anglia, I.roffey@uea.ac.uk



Biography

After completing a BA in Geography and MA in Environment, Development and Policy at the University of Sussex Lauren came to the University of East Anglia in 2007 on an ESRC funded 1+3 studentship. Her PhD research examines the role of privileged actors in environmental policymaking through an examination of the aviation industry in the UK.

Abstract

To date there has been no research which seeks to understand the role of the aviation industry within the context of environmental policymaking. This gap is addressed here through an in-depth historical examination of how the aviation industry has been able to achieve its goals since the post-war period. The decision to develop Stansted as London's third airport is the focus of this presentation.

Through an examination of the aviation industry in the UK this research critically analyses the role of privileged actors in environmental policymaking. Historically, the aviation industry appears to have been unhindered in its progress, whether it is through planning permission for new runways, tax breaks or exclusion from climate change targets. This research aims to shed light on whether the aviation industry does have such a powerful position in environmental policymaking, and if so how and why it is able to maintain it. This is tested through an understanding of environmental policymaking and political theory, focusing on the role of the state in maintaining a balance in the UK policymaking process within the context of European and international influences.

Two opposing political theories will be employed to help guide the analysis, aiding the explanation of how certain groups dominate the policymaking process: the Advocacy Coalition Framework (of neo-pluralist origin) and the Strategic-Relational Approach (of neo-Marxist origin). Modern exemplars, they illustrate the opposing poles of how power and influence are distributed in the policymaking process and are yet to be theoretically compared. Extensive archival work and elite interviewing form the evidence base.

The search for a third London airport and the subsequent development at Stansted indicates that the economic and social benefits of aviation are continually given priority over environmental concerns, and with the lack of environmental policy relating to the aviation industry at national, European and international scales it appears that the political system privileges industry and economic growth over all other concerns. Future work looking at the decision to approve a second runway at Manchester will help to clarify these ideas and to further understand how it maintains this position.

CAN PARTICIPATORY EMISSIONS BUDGETING ASSIST AUTHORITIES IN TACKLING CLIMATE CHANGE?

Tom Cohen

University College London, thomas.cohen.09@ucl.ac.uk



Biography

Tom started studying for a doctorate at UCL in October 2009 after a decade in transport consultancy, prior to which he had worked as a fundraiser and project developer in the voluntary sector. He is particularly interested in citizen participation in governmental planning. Other interests include methods of decision making, decision support tools, the psychology of behaviour change, marketing and the presentation of information.

Abstract

(a) Given the need for very large cuts in greenhouse gas (GHG) emissions, and widespread scepticism concerning the capacity of new technology to deliver these reductions on its own, it is generally accepted that significant behaviour change is required on the parts of all actors, including institutions. One reason governmental bodies hold back from emissions-reducing measures is fear of public opposition; this suggests that the relationship between citizen and government needs to change if government is to make real progress towards its emissions targets. The need is for a relationship based more on collaboration in the face of a shared challenge and future vision, a key part of which would be greater acceptance on the part of citizens that government intervention has a large part to play in delivering the necessary change.

(b) Participatory budgeting (PB), based on financial constraints, has a strong track record of involving larger numbers of citizens and of attracting a more diverse profile of participants than many other forms of citizen participation, thereby giving its conclusions greater perceived legitimacy amongst policy makers whilst also fostering more positive attitudes amongst citizens towards the sponsoring authority. The question is whether an adapted form of PB, including the emissions arising from policy options as well as their cost, could harvest these benefits at the same time as assisting the authority in implementing measures that address the climate change challenge.

A case study authority is being used to test participatory emissions budgeting (PEB), with citizens invited to take part in a deliberative process leading to the selection by voting of a package of policy measures subject to two constraints – one emissions-related and the other financial. The evaluation of the trial will test for the effect of the emissions constraint upon both the deliberative process and the nature of the decisions reached.

A central part of the work will be the creation of a calculus for greenhouse gas emissions that enables the effects of given policy measures to be seen at two levels – pan-authority (ie including emissions attributable to residents and organisations based within the authority); and intra-authority (isolating emissions directly attributable to the authority's activities). This two-level measure will enable citizens to weigh up policy options in an informed manner, using appropriately adapted deliberative methods.

(c) If the PEB trial suggests that this method can lead to more sustainable packages of measures than authorities would otherwise implement, two questions naturally arise: how to ensure that it is more widely applied, and how to ensure that its use contributes to emissions reductions of the scale required to keep climate change within "acceptable" limits. Wider application would depend upon the range of governmental bodies expanding their adoption of democratic decision-making methods in general and of the PEB model in particular. With respect to scale, the trial will help to demonstrate what levels of emissions reduction citizens feel acceptable (following informed deliberation); only practical application can show whether the wider community can be convinced to accept the conclusions of their peers.

CLIMATE AND THE DECISION TO MIGRATE

Helen Adams

Tyndall Centre for Climate Change Research, The University of East Anglia, <u>h.adams1@uea.ac.uk</u>



Biography

Helen Adams has five years experience working on the impacts of, and adaptation to, climate change at a national and international level both in policy formation and research. After studying Natural Sciences at Durham University with a focus on geology, she went on to work on adaptation policy frameworks in the water sector at the OECD and to support negotiations on adaptation under the UNFCCC before enrolling on an MRes in Environmental Social Science at UEA as part of a 1+3 scholarship with the ESRC.

Abstract

Climate change migrants and refugees continue to be of significant interest to both the academic world and the popular press. Wholesale out-migration is often conceptualised as a certain consequence of the negative impacts of climate change. However research shows that, depending on the context, environmental degradation can both increase and decrease rates of out-migration.

This talk outlines a descriptive theory for understanding the impact of slow-onset environmental change on the decision to migrate. Three concepts are used to quantify internal differentiation in migration responses with environmental change: satisfaction with place, mobility potential and ecosystem services.

Empirical data on these three components was collected to test and create an environmentally-relevant theory of migration. Preliminary results show different levels of place utility and mobility potential within a population, consistent with existing theories. Information collected on use and importance of ecosystem services, allows the contribution of the environment to place utility to be assessed and those most likely to be affected by changes in the environment identified. The final goal is to determine the characteristics of people most likely to migrate as a result of climate change, and understand how this changes with ecosystem services.

Data collection was undertaken in a rural-to-urban, migrant sending area in the central Peruvian Andes, in the Rímac valley, east of the capital Lima. Social surveys were carried out in settlements over a range of climate and biophysical zones. Within this valley provision of ecosystem services changes rapidly over short distances and there is a wide range of climate-sensitive and climate-independent income opportunities.

Migration is often seen as a failure of adaptation, but it is in fact a key adaptation to changing environmental and socioeconomic stressors. Recognising the complex nature of the migration decision and the different ways in which people interact with their environment will allow climate change migration to be managed to maximise its benefits and protect the most vulnerable: those highly dependent on ecosystem services with a low potential to migrate.

THE ROLE OF ECOSYSTEM SERVICES IN THE RESILIENCE OF RAPIDLY URBANISING AREAS

James Waters



Tyndall Centre for Climate Change Research, University of East Anglia, jjj.waters@gmail.com

Biography

James (JJ) Waters is an ecologist by training, whose keen interest in conservation issues took him to Kenya where he learned the challenges of integrated conservation and development. He later gained invaluable experience working on the scoping phase of the TEEB project ('The Economics of Ecosystems and Biodiversity'), developing a broad understanding of the importance of ecosystem services, their complex interactions and dynamics. Having become fascinated with the pace and scale of urbanisation as a global driver or change, his masters thesis focused on urban resilience to climate change, and the role of ecosystem services therein. Whilst interested in ecosystem-based approaches to climate change, he now focuses on rapidly urbanising areas as social-ecological systems, and the interaction between ecosystem services and social aspects of adaptive capacity. This has taken him to Kampala, Uganda, where he will be carrying out the bulk of his fieldwork later this year.

Abstract

The role of ecosystem services in the livelihoods of the world's rural poor is relatively well understood, however the same could not be said for urban populations. Further, the link between social facets of resilience, such as social networks, and ecological aspects such as the range and diversity of ecosystem services available, is not well understood, less empirically supported. By focusing on both peri-urban ecosystem services and the relationship to adaptive capacity, this research aims to work out how human and ecosystem services can be maximized to increase well-being of rapidly urbanising populations. This is of global significance, as one billion people currently live in slums, and 1.3 million people each week move to cities, such that there may be another billion by 2030. These city-dwellers are vulnerable to a range of impacts, including climatic change, and it is often the poorest that have least adaptive capacity to these challenges.

These issues can be seen playing out in the rapidly urbanising city of Kampala, in Uganda. Preliminary research documenting the range of ecosystem services generated from a local wetland and surrounds reveals that tradeoffs exist between ecosystem services, and users. Values and benefits to the local community are identified, including those beyond which are normally accounted for in ecosystem valuation. Individuals are observed making tradeoffs between available benefits in very different ways between rural and urban settings. Finally the relationship between individuals' social networks, and ecosystem service use is explored.

These dynamics from the forefront of the urbanisation transition demonstrate the importance of ecosystem services for the adaptive capacity of a huge proportion of humanity. New light is shed on the unfolding relationship that people in these contexts have with their local ecosystems, and how this will affect the resilience of the social-ecological system as a whole. It raises questions of equity, and the future of urban ecosystems. Moreover, there is a transition in the importance of, and relationship between social and ecological systems. This empirical evidence, from changing patterns of social networks and portfolios of ecosystem services utilised, makes an important contribution to our understanding of the relationship between social and ecological resilience.

CLIMATE CHANGE INDUCED CHANGES IN EXTREME WEATHER EVENTS

Rita Yu

Tyndall Centre for Climate Change Research, University of East Anglia, <u>*rita.yu@uea.ac.uk*</u>



Biography

Rita is currently a PhD Researcher with the Tyndall Centre for Climate Change Research at the University of East Anglia. Her research interests include climate change induced changes in extreme weather events, and the uncertainties in climate modelling. Prior to her PhD, she worked in an environmental consultancy, primarily on a comprehensive study on climate change in Hong Kong for the Hong Kong Special Administrative Region Government that aimed to assist the Central People's Government of China in preparing its national communication that covers Hong Kong as part of its region to fulfil the obligations under the UNFCCC. She was the Project Co-ordinator in this study, as well as the technical lead in the climate change vulnerability and adaptation assessment. She has an MRes in Environmental Sciences and a BSc in Environmental Sciences, both from the University of East Anglia.

Abstract

As climate changes, a change in the occurrence, frequency, and/or intensity of extreme weather events can seriously impact on lives and livelihoods. This leads to a growing demand globally for better estimates of potential future extreme weather from decision-makers in the public and private sectors, other stakeholders as well as the general public. Drought can affect virtually all climate regimes, including both temperate and arid areas. Its occurrence can have agricultural, hydrological, ecological and socio-economical implications. Drought is also one of the most damaging natural disasters in human, environmental, as well as economic terms. The identification of potential changes in drought characteristics can provide essential input to adaptation and planning strategies, and hence has both strategic and policy implications.

Considerable uncertainties remain in current climate change projections, in particular for extreme weather events. Uncertainties arise not only from future atmospheric greenhouse gas concentrations and climate models, but also the different types and definition of drought. Intercomparisions of carbon cycle models and AOGCMs are essential in assessing the uncertainties associated with projections of future extreme weather events. This PhD project aims to develop improved projections of extreme weather events, with a particular focus on drought events, in various world regions, as well as to understand the robustness of these projections by examining the various sources of uncertainties in extreme weather projections. The Tyndall Centre's multi-institutional modular – "Community Integrated Assessment System (CIAS)", a flexible integrated assessment system for modelling climate change – is used to provide policy relevant information for decision makers.

NUCLEAR DISTRICT HEATING; OR WHY WE NEED TO BE BOLDER AND MORE AMBITIOUS IN ORDER TO CHANGE UK HEAT SUPPLY

Christopher Jones

Tyndall Centre for Climate Change Research, University of Manchester, <u>c.w.jones@postgrad.manchester.ac.uk</u>



Biography

I have had a chequered academic past, including a BA in History and an MA in Politics, prior to my PhD research on utilising nuclear energy for heating services. Much of my pre-PhD energy sector knowledge comes from working in Aberdeen as an analyst on oil, gas and renewable energy projects. I am currently based the Tyndall Centre for Climate Change Research at the University of Manchester and I am funded through an EPSRC/ESRC on the Sustainability of Nuclear Power (SPRIng). My research adopts an inter-disciplinary approach including socio-technical transitions and practice theories, spatial analysis and scenario building.

Abstract

Nuclear district heating involves the transport of heat from a nuclear fission reactor to heat service consumers through a network of highly insulated hot water pipes. The utilisation of thermal energy from a nuclear reactor in this way can increase the energy efficiency of a nuclear power station from 35-37% (electricity only) to 50-80% (electricity and heat). This makes better use of uranium resources and offers a low carbon alternative to fossil fuel heat supply that is predominant in the UK. Furthermore, such a community-wide approach is likely to be more affordable for low income households than individual low carbon technologies.

Research carried out for this PhD so far has assessed the technical feasibility, environmental benefits (from a climate change mitigation perspective), identified organisational configurations and public perception issues. The research suggests that such an approach is feasible and that there is a significant opportunity to reduce emissions from heat supply in appropriate areas.

Nuclear district heating does not require technical innovation as the technology already exists and has been trialled successfully. What is missing is an alignment of actors and a willingness to overcome barriers, both real and perceived, which requires social, organisational, financial and political innovations. The research is informed by socio-technical innovations theories and draws on stakeholder interviews and public focus groups to identify barriers and support mechanisms.

This technology could be part of a more varied and resilient heat services supply infrastructure that provides affordable, low carbon heat to all sectors of society. Presently the provision of heat services (space heating, water heating, industrial process heat) in the UK is not varied, resilient, affordable for all sections of society, or low carbon. Heat services account for 47% of national CO_2 emission and supply is <1% low carbon. Fuel poverty remains high (3.3 million households) and deaths associated with inadequate heating (excess winter mortality) in the UK are amongst the highest in Europe. These problems are - broadly speaking – caused by poor energy efficiency in households and a reliance on natural gas for ~80% of heat services.

To get to where we want to be in the UK we need bolder and more ambitious approaches to heat, where policy already lags behind electricity and transport. Nuclear district heating could be a component of this if we give it proper consideration.

THE SOCIAL AND POLITICAL ECONOMIC DIMENSIONS OF BIOMASS ENERGY DEVELOPMENT IN SCOTLAND

Lucy Brown

The University of Strathclyde, lucy.brown@strath.ac.uk



Biography

Originally from rural Galloway in south west Scotland, I have been living in Glasgow for the past seven years. After a couple of years studying sound engineering and working in live music, my involvement in political activism and an academic interest in people, power and the environment prompted a change of direction; and I graduated with a First Class Honours degree in Sociology from the University of Strathclyde in the summer of 2010. My interest in the issues surrounding climate change, risk communication and community engagement in particular was developed as the result of an undergraduate research internship during which I worked on a project analysing governance, planning and risk in Grangemouth; a town in central Scotland dominated by the presence of a major petrochemical complex. In October 2010, I began my PhD at Strathclyde. My current research focuses primarily on the political economy and community acceptance of large-scale biomass power in the Scottish context. As part of this research, two developers with plans for large-scale biomass power plants will be taken as case studies. While the case study of the 'Lifetime Recycling Village' is located on the outskirts of a leafy suburban community just south of Glasgow, the second case - Forth Energy - have plans for biomass development in the coastal port communities of Rosyth, Dundee, Leith – and Grangemouth.

Abstract

Based on original empirical research, this paper analyses the social and political economic dimensions of biomass energy development in Scotland. This paper assesses the impact of community engagement and environmental communication strategies on community perceptions of risk relating to large-scale biomass power plants; assesses the role of the Scottish renewables lobby and emerging forms of neoliberal environmental governance; and investigates patterns of ownership within the biomass industry and regulatory regimes at the Scottish, UK and European levels. This research takes Forth Energy and Lifetime Recycling Village as suitable foci for case studies on the political economy and social dimensions of biomass development. As the developments in question are each projected to generate over 50MW of electricity, the applications will be subject to the scrutiny of the Scottish Ministers in accordance with section 36 of the Electricity Act 1989. The subject of the first case study, Forth Energy, is a partnership between UK ports operator Forth Ports and energy company Scottish and Southern Energy. The partnership has invested £1.7 billion in four 'Renewable Energy Plants' planned for Leith Docks, Grangemouth, Dundee and Rosyth. While the Grangemouth, Dundee and Rosyth biomass plants will each produce 100MW of power, the Leith plant is projected to produce 200MW. The second case study focuses on the Glasgow-based waste management company Lifetime Recycling's 'Lifetime Recycling Village'; proposed for development on land on the outskirts of the suburban community of Newton Mearns. The generation of electricity from biomass constitutes one element of the mixed waste processing planned to be carried out in the Lifetime Recycling Village; other techniques employed on-site will include mechanical recycling and plasma vitrification. The developers state that a minimum of 56MW of electricity will be exported to the National Grid.

Employing semi-structured interviews, documentary research, media analysis and observational work, the research with community stakeholders, local governance actors, industry representatives and others interested in biomass analyses the social, political and economic factors related to the development of biomass power in Scotland. The research will compare the respective approaches to community engagement and risk communication; focussing on measures to mitigate community 'outrage' and frustration regarding their relative weakness in the contestation of the risk posed by local biomass development. It will be argued that the lack of an agreed and legislated set of criteria for the sustainability of biomass supply aggravates communication problems and contributes to more widespread public anxieties surrounding the role for biomass as part of Scotland's 'energy futures'. Related to questions of sustainability, the appropriateness of subsidising large-scale biomass power as part of Scotland's Renewables Obligation is challenged. In broader terms, it is suggested that biomass energy development has received insufficient political scrutiny under the Scottish Government and that more research is required to contribute to the creation of a policy context in which planning for energy development is more able to reconcile local and national developmental priorities.

STRATEGIES FOR THE SUSTAINABLE PROVISION OF ELECTRICAL POWER AND WATER SUPPLY FOR DESERT COMMUNITIES

Sadiq Ali Shah

The School of Mechanical, Aerospace and Civil Engineering, Manchester University, Sadiq.Shah@postgrad.manchester.ac.uk

Biography

Mr. Sadiq Ali Shah graduated in Mechanical Engineering with distinction from MUET, Jamshoro, Pakistan. He did masters in Business Administration from IBA, Karachi, Pakistan. He joined energy sector in 1995. He has 10-years experience in gas distribution and transmission systems. He was awarded Merit Scholarship for PhD programme abroad by the Ministry of Education now called Higher Education Commission Islamabad. He was awarded ORS Top-up scholarship by the school of MACE, the University of Manchester for PhD (Mechanical Engineering).

He started research in Mechanical Engineering on the topic "solar-powered desert economy development" in 2008 in the school MACE. So far, he has presented two posters on his research in annual MACE conferences in 2009 and 2010. He presented a paper on "Energy Scenario and Options for China" in China Postgraduate Network Conference, held in Manchester in April, 2009. He presented second paper on "Hybrid Energy based and CO₂ Sequestration Capable Desert development" in the International Conference on Energy Systems Engineering, held in Pakistan in October 2010.So far his one research paper is published in ISESCO journal on Science and Technology Vision on "Prospects of Coastal Solarization for Freshwater and Electricity production" and his three papers are is submission stages for publication in international journals.

Abstract

The prime objective of the research is to evaluate the prospects of solar power generation and brackish water desalination processes in the deserts of solar-rich countries. The ultimate result would be that considerable volume of CO_2 emissions could be reduced in the whole scenario. The worth of the strategies is established on self-contained nature of energy generation, environmental emission reduction and sustainable desert community development. Possible deserts sites in Pakistan are discussed, and an analysis of the feasible sites has been carried out to study its positive impact on the existing capacities of power generation and freshwater production.

Introduction: The supply of freshwater and electricity are essential for the development of a sustainable desert community life. There are a few deserts locations which either have natural oasis or underground fresh water aquifers. However, most deserts either have underground brackish water or are far away from the natural water resources such as rivers.

Because the deserts are remote from industrial centres therefore practical ways have to be found for the generation of electric power and fresh water to meet the basic needs of desert communities and to facilitate crop cultivation based local economy by the utilization of indigenous energy potential and other available resources. Sustainable energy and desert land resources utilization strategies are devised for the development of desert communities, providing a viable alternative to fossil-fuelled power generation and freshwater production.

The use of abundant solar power generation and consequent brackish water desalination is an interesting way forward. However, there are prerequisites for a feasible solar power generation process. Solar energy has low intensity per unit area, which means that relatively large area is required to generate useful amount of energy. Deserts are probably the only sizeable land areas that are capable of providing energy at a price that can compete with fossil-fuelled power generation (Wheeler and Ummel, 2008). In theory, large amounts of clean energy could be generated and the volume of CO₂ emissions could be reduced by this two pronged strategy for desert power utilization. Pakistan is rich in solar energy most of the year and its deserts could be utilized for solar power generation (Shah, 2010; Mirza, 2003).

Methodologies: Needs analysis and mass and energy balances for a sizeable desert community are carried out to identify their basic needs and to calculate the total amount of energy required for meeting these needs.

Results: According to the preliminary results it is clear that the problems of fresh water unavailability, lack of electric power and desert land infertility could be resolved sustainably through the utilization of underground brackish water and available solar potential (energy) falling over a small fraction of the total desert land (less than one percent of total deserts' land).

Conclusion: It is concluded that a pilot project could successfully be carried out at Thar, Thal, Cholistan and Chagi Kharan deserts for the ultimate aim of the development of their desert communities.



BIOFUELS AS A PERTURBATION TO THE RESILIENCE OF FOOD SYSTEMS AT MULTIPLE SCALES

Jennifer Hodbod



Tyndall Centre for Climate Change Research, University of East Anglia, <u>j.hodbod@uea.ac.uk</u>

Biography

Jennifer is in the second year of her PhD in the School of Environmental Sciences at the University of East Anglia. As an affiliated Tyndall Centre PhD Researcher, she has an interest in sustainable agriculture as a development tool in response to global environmental change. Her research addresses the expansion of biofuels in developing countries, specifically Ethiopia, to examine the nexus of food and energy security. Jennifer is also incorporating resilience into her studies as a conceptual and methodological framework, as it allows her to address food systems as complex systems, and highlight the positive and negative impacts of biofuel expansion across multiple temporal and spatial scales.

Abstract

The increased awareness of climate change by national governments in developed counties led to the rapid introduction of biofuel policies as a method of reducing greenhouse gas emissions whilst decreasing dependence on fossil fuels and hence increasing their energy security. Developing countries are now also introducing biofuel policies, but the priority is often as an additional export product.

Whatever the reason behind the policy introduction, the use of first-generation biofuels (i.e. food crops such as maize and sugar cane to produce bio-ethanol, or soy to produce biodiesel) creates competition for land between crops for use as food and for use as energy. There is also competition within the market to supply both demands. The increased production of biofuels in developed countries in recent years was attributed as one of the main causes of the price spikes seen in agricultural commodities in 2007. Such an increase in prices has far-reaching impacts on food security and malnutrition for the populations of many developing countries. Hence, biofuels can be shown to impact multiple systems (food, land, energy) at multiple scales (household, regional, national, global).

By focusing on biofuel introduction or expansion as a policy response, this paper frames biofuels as a perturbation to the food system at multiple scales, allowing the impacts on social-ecological resilience that emerge to be identified. The current literature presents evidence that biofuels can erode the resilience of social-ecological systems, for example via deforestation, agricultural run-off and increased food prices. However, there are also opportunities for biofuels to enhance the resilience of social-ecological systems- for example by the substitution of traditional biomass in rural households in developing countries. This would reduce deforestation in the immediate area or increase agricultural residues returned to agricultural land, whilst allowing households to move up the energy ladder. This paper presents a systems analysis of the impacts of biofuel expansion in Ethiopia, summarising the impacts on resilience at multiple scales and for multiple actors, from the household to the national level and focusing on systems where biofuel substitutes for fuelwood as well as affecting food production.

The framing presented in this paper allows the complexity within food systems to be acknowledged, and the factors that erode and enhance resilience to be identified and weighted, so to provide an overall indication of the impact of biofuel expansion on the resilience of food systems. By combining the different scales of analysis, a broader insight is provided into the impacts of biofuel expansion on a country's food systems than by using a single method such as life cycle analysis or costbenefit analysis. Taking a whole system perspective also allows the interactions and possible pathways between adaptive cycles to be addressed.

THE WAYS IN WHICH CLIMATE CHANGE AFFECTS TRANSBOUNDARY WATER RELATIONS (TBWR) IN THE NILE BASIN.

Nina Hissen



Tyndall Centre for Climate Change Research, University of East Anglia, <u>n.hissen@uea.ac.uk</u>

Biography

Nina is a PhD research at the School for International Development (University of East Anglia) and affiliated with the Tyndall Centre for Climate Change research. Her research focus is the impact of climate change on conflict and cooperation over transboundary water resources in the Nile basin. Before starting her PhD, Nina did her undergraduate and graduate degree in Political Science at the Free University, Berlin, Germany. In particular, her focus was on Peace and Conflict studies with a regional focus on Afghanistan, as well as Sociology. During and after her studies, Nina worked for various government institutions with a policy and development focus, among others in Berlin, Washington, D.C., Singapore, and Uganda.

Abstract

This research aims to understand the ways in which climate change affects transboundary water interaction (TbWI) in the Nile basin. TbWI encompass varying levels of conflict and cooperation over questions related to the sharing of water resources. The objective of this research is to understand why conflict or cooperation over transboundary water resources prevails. The focal point of this analysis is on the role of formal and informal social institutions which manage TbWI, and their level of vulnerability to climate change.

The case study centres on the Nile basin, which is particularly interesting when studying the combination of TbWI and climate change; the basin comprises ten riparians (Egypt, Sudan, Ethiopia, Eritrea, Uganda, Kenya, Tanzania, Burundi, Rwanda, DR Congo) and a population of 160 million people which makes it one of the largest in the world. All riparian states are greatly underdeveloped, conflict-stricken and have very weak levels of national governance. In addition, water in the Nile basin is already scarce and climate variability is high.

Together, these factors contribute to high levels of vulnerability and low adaptive capacity. Because carbon emissions are already low, adaptation instead of mitigation needs to be the strategy for these countries to deal with the socio-economic consequences of climate change.

This research argues that conflict resolution and enhanced cooperation efforts over transboundary water resources is one possible adaptation strategy to the impacts of climate change. Firstly, policy measures related to conflict resolution need to be climate-sensitive, since they have the potential to have the opposite effect and increase rather than solve conflict. Secondly, the adaptive capacity of social institutions to the consequences of climate change needs to be heightened. In order to understand the current adaptive capacity and develop an outlook for future change, this research examines the social institutions which manage TbWI across multiple policy levels.

REDUCING EMISSIONS FROM DEFORESTATION AND DEGRADATION (REDD PLUS): AN OPPORTUNITY FOR MULTIPLE BENEFITS OR A PROPOSAL OF MULTIPLE RISKS

Ashish Aggarwal



University of Manchester, UK & The Energy and Resources Institute (TERI), India, enviroashish@gmail.com

Biography

I have been working on issues related to environment and development with NGOs and research organisations in India. Currently, I am a PhD candidate at School of Environment and Development (SED). I am interested in understanding political economy of deforestation and degradation and its role in climate change debate through the proposed mechanism of Reducing Emissions from Deforestation and Degradation (REDD+). I want to understand how neoliberal ideas have shaped REDD+ and what impacts it might have on forest conservation and livelihoods of forest dependant communities in India.

Abstract

Deforestation and degradation in tropical countries contribute between 12-17% of global greenhouse gas (GHG) emissions (IPCC, 2007; Vander Werf et al., 2009). Hence, there is an increased focus on reducing deforestation and forest degradation, conservation, sustainable forest management and afforestation (collectively known as REDD plus) in the international climate change regime. Besides, the potential for large scale reduction in GHGs, REDD plus has been projected as a low cost and effective strategy to mitigate climate change (Sathaye et al., 2007; Stern, 2007). It has been estimated that 51-78% of the total carbon benefits could be attained by reducing deforestation by the year 2100. Half of these carbon benefits could be availed at low carbon prices in the range of \$5 to \$10/ tC (Sathaye et al., 2007). It could generate significant revenues for the developing countries as well. It has been estimated that annual revenues from REDD could go up to \$23 billion (El lakany et al., 2007). In addition, REDD could generate co-benefits in form of conservation and livelihoods (UNEP-WCMC, 2007). Hence, REDD has been projected as a win-win strategy for mitigation of climate change and development of poor countries.

But, a number of researchers and civil society groups contest this view and argue that REDD projects could adversely impact livelihoods and rights of indigenous groups and local communities (Griffiths, 2007; Lovera 2008; Rawles, 2008). These concerns emanate from the fact that a small fraction of land is under legal tenure, and rights of the communities remain contested over the large part of the land, especially forest land in the developing world. It has been reported that various countries of Africa have only 2 to 10% of the land under formal tenure (Deininger, 2003). In such a scenario, it is very likely that forest resources, which will become even more financially attractive with potential REDD plus money, will be captured by powerful stakeholders like state, investors or elites within the communities (Rawles, 2008). The major chunk of carbon benefits could go to these groups, and local communities could be further marginalized. It has also been argued that REDD plus could lead to carbon centric forest management, which could undermine the biodiversity of the forest ecosystems. Hence, a number of civil society groups across the globe are opposing REDD plus.

In this context, it becomes imperative to analyse potential opportunities and risks of REDD plus. This paper analyses these issues through the case of India, which has been a proactive member in the REDD plus policy debate through its 'compensated conservation' approach. After a critical analysis of forest and biodiversity conservation policies, drivers of deforestation and degradation and initiatives on recognition of forest rights, it has been argued that REDD plus should be used as an opportunity to improve forest governance through strengthening participatory forest management and recognition of the rights of forest dependant communities. Otherwise, it could lead to further centralisation of resources and marginalisation of poor in the country.

OPTIMIZING WORLDWIDE DEPLOYMENT OF WIND AND SOLAR POWER TECHNOLOGIES VIA A HIGHRESOLUTION, SPATIALLY-EXPLICIT LINEAR PROGRAMMING MODEL

Kevin Ummel

MESPOM Candidate, University of Manchester, KevinUmmel@gmail.com

Biography

Kevin is completing a MS in Environmental Science, Policy and Management (MESPOM) with the University of Manchester and Central European University. Consulting for the Center for Global Development (CGD) as a Senior Visiting Associate, his recent work attempts to model the geospatial and economic implications of large-scale renewable power deployment. From 2006 to 2009, as a researcher at the CGD in Washington, Kevin co-developed the Carbon Monitoring for Action (CARMA) global power plant emissions database and published a study of North African concentrating solar power potential. He is also pursuing a degree in Ecological Design from the San Francisco Institute of Architecture while drawing up plans for a low-cost, zero-energy home that he and his fiancé, Sarah, hope to build themselves. Kevin can't stand hypocrites and people who author their own biographies. He holds a BA in Public Policy from Stanford University.

Abstract

Despite widespread agreement that renewable energy is central to a sustainable, low-carbon future, it remains unclear how to exploit worldwide resources in a way that minimizes the cost of greenhouse gas mitigation. Lacking this information, clean energy financing tends to be suboptimal, leading to investment in technologies and places with higher abatement costs than could be achieved elsewhere. Without transparent, well-informed strategies for selecting where, when, and how to utilize renewable resources, public subsidies (via national governments or international donors like the World Bank) are likely to be captured by politically-favored industries, even if such investment is comparatively inefficient or, worse still, hampers a country's long-term potential for greenhouse gas mitigation.

The electricity sector is an ideal candidate for rapid transformation to clean energy. Global potential for wind and solar power is massive, and the required generating technologies are well developed and commercially available. But it is difficult to identify the optimal architecture of renewables-based power systems, especially when assessing multiple technologies across continent-scale areas and several decades. The complexity of such systems requires large amounts of spatially- and temporally-explicit data to be integrated in a high-resolution model.

While conventional energy models provide extensive sectoral coverage, their spatiotemporal resolution is far too low to produce results useful in guiding investment decisions.

This paper describes the development of a Spatially-Explicit Power and Transmission (SEXPOT) computer model capable of identifying cost-minimizing strategies for exploiting worldwide wind and solar energy resources for electricity generation. SEXPOT incorporates high-resolution geophysical and socioeconomic data within a linear programming environment that specifies the primary techno-economic parameters affecting the cost and performance of renewable power technologies. Minimization of the model's spatially-explicit cost function allows optimal deployment strategies to be resolved with much greater spatiotemporal detail and policy relevance than conventional energy models.

Model output reveals the preferred mix of wind and solar power technologies across space and time as well as facility and transmission line siting and the magnitude of public subsidies needed to achieve a given greenhouse gas emissions pathway for the global power sector. A spatially explicit, multi-technology model like SEXPOT is capable of addressing key socioeconomic, geopolitical, and environmental questions concerning the future of renewable energy. In addition, SEXPOT's development has resulted in a number of novel spatiotemporal data products likely to be of interest to the broader research community.

OPENING UP FOR PLURAL VISIONS OF THE IDEAL FUTURE TO INITIATE TRANSITIONS

Evelina Trutnevyte

Natural and Social Science Interface, Swiss Federal Institute of Technology in Zurich (ETH Zurich), Switzerland, <u>evelina.trutnevyte@env.ethz.ch</u>

Biography



I have a MSc degree in Power Engineering with specialization in urban energy planning from Vilnius Gediminas Technical University, Lithuania. During my Master studies, I was an exchange student at the Aalborg University in Denmark and conducted scientific internships at the Power Systems Lab of the Swiss Institute of Technology in Zurich (ETH Zurich) and at the Lithuanian Energy Institute. For two years I worked in one of the leading engineering consulting companies in Lithuania. In November 2008, I joined the Natural and Social Science Interface group at ETH Zurich. In my PhD studies, I work on approaches for linking the modeling and assessment of energy systems with the visions and preferences of the multiple stakeholders, especially in the cases of small rural communities.

Abstract

Most transitions to sustainable futures start with an envisioning process, when several key stakeholders develop a common vision of their ideal future. Such visions are meaningful because they often lead to a common understanding of the present, stimulate strategic discussions about appropriate goals and build commitment for future action of all involved stakeholders. However, these visions often have three shortcomings. Firstly, such an envisioning process may lead to a narrow range of possible envisioned future options, often influenced, biased, dominated by the background of certain stakeholders, e.g. technical experts, most powerful actors or supporters of the latest media hypes. Secondly, such visions are often rather generic and not contextualized to specific local circumstances. Thirdly, little attention is paid to the feasibility and the potential consequences of the vision becoming reality.

In order to develop better visions, we propose a novel approach for an iterative, analytically supported envisioning process with public involvement. This approach starts with "opening up" (as expressed by Andy Stirling) for plural visions that may exist in society, i.e. among decision makers, stakeholders, public at large and academia. Then, the elicited plural qualitative visions are "translated" into a number of quantitative scenarios that show different, feasible options for the actual implementation of these visions. The consequences of the visions can then be assessed by, for instance, a stakeholder-based multi-criteria assessment. This analytic modeling of visions is embedded in an iterative process involving relevant actors repeatedly: in the beginning for eliciting the visions, later for eliciting the relevant criteria and their weightings, and at last for discussing results from the whole exercise. The case of the future energy system in the small Swiss community of Urnäsch will be used as an illustration. This case shows the plurality of visions in the real world and illustrates how the proposed approach induces learning effects, after the involved actors are confronted with the visions of others and with the analytically derived representations and consequences of all visions.

The presented approach of "opening up" the envisioning processes and analytically refining the visions can be used as a learning tool, as a means for consensus building among the different actors ("closing down," according to Andy Stirling) and, thus, also for achieving stable commitments of the involved actors for the implementation of feasible and acceptable visions. Applications of the proposed and similar approaches for an inclusive, engaging and methodologically sound development of better visions, before initiating transitions, is my vision of the ideal-type societal decision-making process towards sustainable development.

A METHOD OF GENERATING GEOGRAPHIC INTERDEPENDENCE BETWEEN CRITICAL INFRASTRUCTURE ASSETS.

Matthew Holmes

The University of Newcastle, m.j.holmes@ncl.ac.uk



Biography

I studied Physical Geography at Durham University before completing a Masters in Hydrology and Climate Change in the Civil Engineering and Geoscience department of Newcastle University.

It was here that began researching the vulnerability of interdependent infrastructure networks as the subject of my dissertation. I have continued this interest with current doctoral research as part of the Stream programme.

The Stream programme is the industrial doctorate centre for the water industry bringing five UK universities together with industrial sponsors to produce research and researchers which meet their needs. I am a student at Newcastle University but spend the bulk of my time working closely with my lead industrial sponsor, United Utilities. Severn Trent Water and Yorkshire Water are also contributing to the project.

The project, titled "Infrastructure Reliability and Adaptation", aims to develop a strategic planning approach allowing water companies to better judge the risks to their networks from the failure of other networks on which they rely, for example, the electricity grid or communications network.

Abstract

The extent to which critical infrastructure systems support our lives continues to grow. Consider, for example, the emergence of smart-phones and 3G mobile networks. Associated with this growth is an increasing interconnection and interdependence between these systems. This is embedded in many people's vision of sustainable futures, for example in smart grids and electric vehicles.

Whilst our dependence increases, increasingly frequent extreme weather events are one of climate change's anticipated impacts (UKCP09 2009). As a result we can expect an increasing risk of interruptions to the infrastructure networks which support our daily lives. Truly sustainable solutions need to demonstrate resilience to this threat.

There is growing national and international attention to the fragility and interdependence of infrastructure systems (e.g. CST 2009, Buldyrev et al. 2010). Most research has focused upon the flows between different networks (i.e. electricity powering water pumps), frequently in the abstract form of graph theory. Less attention has been paid to the importance of geographic, or co-located, interdependence.

It is logical that important assets which are close to each other are likely to be affected by the same hazard. The Calva Bridge, almost swept away by the Cumbrian floods in 2009, carried not only vehicles but also water and electricity pipes. On the other hand, those assets which are further away may escape harm and offer an opportunity to maintain the required level of service.

This paper proposes a probabilistic method to model this geographic interdependence. The importance of proximity is derived by comparing the distance between observation stations and the correlation between their hazard records. This relationship can be used to estimate the correlation between hazards at two different asset locations. The mean and variance of the hazard value at these locations can be derived from spatial averaging techniques such as splines or kriging. This data is combined to form a multi-variate probability distribution, with each asset as a dimension, from which hazard values can be sampled.

The method is not without limitations but captures the expected pattern of values at the required locations. More importantly it represents the concurrence of hazards at those locations within close proximity of each other.

Identifying which assets are likely to fail simultaneously enables better risk-based decision making. Seemingly resilient parts of the network with many links may prove vulnerable due to the probability of these connections failing simultaneously. Savings can also be identified. There is, for example, limited value in protecting the electricity substation on a wastewater treatment works from flooding if the works is likely to be flooded and inoperable in any case.

This research is part of a wider project studying how to support water utility companies in making intelligent, risk-based decisions about infrastructure interdependence. It highlights the importance of representing geographical interdependence and offers a method by which to achieve this.

CARBON REDUCTION IN THE UK DOMESTIC SECTOR

Chris Foulds

University of East Anglia c.foulds@uea.ac.uk

Abstract

Household energy consumption is responsible for around 24% of UK carbon emissions, which accounts for around two-thirds of UK building emissions. The Government aims to reduce housing sector emissions to almost zero by 2050 (DECC, 2010). The focus is on two broad themes associated with this challenge: [1] improving insulation of existing UK housing, and [2] user-technology interactions.

Around 47% of residential greenhouse gas emissions can be attributed to space heating alone (BERR, 2008). The UK Government thus proposes that loft and cavity wall insulation be installed in all suitable homes by 2015. Following which all homes would be subjected to a 'Whole House' improvement whereby more substantial changes (e.g. solid wall insulation, renewables) are implemented by 2030, seven million of which by 2020 (DECC, 2009). Such targets are embedded in the Government's 'Green Deal'. The presented study indicates that of Norfolk housing 12% of cavity walls are empty, 74% have <250mm of loft insulation (5% has none) and 44% are not entirely double glazed. Carbon and cost implications of upgrading insulation, as a result of current policies, were estimated at both Norfolk and UK scales.

The evidence base for the study was the Government's Homes Energy Efficiency Database (HEED), which contains information on 210 million UK dwellings. Despite ambitious objectives, its data has previously been unused by researchers. Recent changes to access agreements also means that researchers will be unable to download HEED data at the high resolution (Census Output Area level) used by this study. Although UK 2001 Census comparisons and data source interrogations highlighted HEED data deficiencies and underlying biases, it is recommended to still play a role in debating future policies. The few similar studies that exist are based on small national samples which give little attention to local context.

However the real question is whether these technological improvements actually trigger the energy savings required. A focus is given to low and zero energy new build homes, which the UK Government are demanding through Building Regulations with increasing energy performance leading up to 2016. Concerns are presented over the assumption that simply building efficient homes with renewable technologies will linearly solve the problem, and that little thought is given to how users interact with innovative systems of provision. Indeed inefficient behaviour could actually be reinforced as a consequence of, for example, cheaper energy and the increased ease in establishing higher internal temperatures. Appreciation should be given to the social norms, attitudes and values associated with different contextual and technological settings. Furthermore, the embodied carbon of these low energy houses should be addressed so as to ensure net lifecycle emissions are not increased in a bid to achieve operational efficiency. Through investigating theses issues, the carbon implications of different low energy housing designs are be explored.

Keywords

carbon reduction; households; insulation; systems of provision.

AN INVESTIGATION INTO THE IMPACT OF THE 2010 UK BUILDING REGULATIONS ON THE DESIGN AND RESEARCH OF LOW AND ZERO CARBON COMMERCIAL BUILDINGS

Alexander John Mitchell

School of MACE, University of Manchester. alexander.mitchell@postgrad.manchester.ac.uk

Abstract

The UK government has a target of making all new commercial buildings 'Zero Carbon' in operation by 2019. Targets have been set out in the 2010 Building Regulations to reduce new build emissions by an aggregate 25% on developments over the last four years.

The research of emissions reduction in building systems and services is a field that is linked closely with the current government legislation. The simulation tools available to the researcher in this area are, to various extents, employed in both the design and accreditation of real projects. The former is undeniably a benefit to the progression towards a low carbon building stock but the latter raises questions as to the mode that research must take and the value of results produced by these tools.

The presentation will first outline the nature of the current government regulation of energy consumption in new buildings and related accreditation schemes, particularly the Building Research Establishment Energy Assessment Method (BREEAM). The nature of the software employed by building services engineers will be laid out, with a focus on the difference between those packages that are accredited for official testing and those that are purely technical in nature. This will be followed by a brief explanation of the thermal simulation process as used to ratify designs for these targets and the options available to the engineer.

The contrast of this method with the use of the same suite of tools to carry out a detailed design process (including a discussion of future proofing and the use of predicted future weather conditions) will then be demonstrated through the presentation of a sample case study from an ongoing PhD research project. This will highlight the potential conflict between a highly demanding standard and a strict assessment method that limits the resources of the designer.

It is the role of the researcher to offer both novel solutions and improved representation of engineering phenomena, however in a cost driven environment there will be the temptation of to exploit loop holes or simply to concede defeat in the face of a need to comply rather than to design. This can be demonstrated best by the consideration of a simple case (such as that explored in the presentation of results) where the designers might exploit a reusable solution that satisfies the criteria of the compliance software but would fail a detailed assessment of its performance.

The final section of the presentation will be given over to a discussion of what would be of value to the researcher when attempting to explore useful avenues for the building services industry (transparency and operational data) and how the incentive to design to the best standard of functionality is of particular benefit to the property developers.

Keywords

Carbon, Buildings, Simulation, Regulations, Engineering

ENGINEERING EDUCATION FOR SUSTAINABLE DEVELOPMENT IN VIETNAMESE UNIVERSITIES: BUILDING CULTURALLY APPROPRIATE STRATEGIES FOR TRANSFORMATION

Phuong Nguyen

University of Gloucestershire, phuongnguyen@connect.glos.ac.uk

Abstract

Over the last few decades, sustainability has become one of the biggest shared concerns over the globe. The concept of sustainable development is the result of the growing awareness of the global links between mounting environmental problems, socio-economic issues and concerns about a healthy future for humanity. In the transition towards more sustainable future, education being widely viewed as playing a key role in building human capacity to tackle sustainable development issues. The report 'Education for Sustainability, From Rio to Johannesburg: Lesson learnt from a Decade of Commitment' by UNESCO, presented at the Johannesburg World Summit for Sustainable Development in 2002 states: "Education not only informs people, it can change them. As a means for personal enlightenment and for cultural renewal, education is not only central to sustainable development, it is humanity's best hope and most effective means in the quest to achieve sustainable development." By joining the UN Decade of Education for Sustainable Development in 2005, Vietnam has officially declared its commitment to embarking on the global journey towards education for sustainable development.

Since then, a number of initiatives have been developed to raise awareness about sustainable development among Vietnamese educational institutions. However, there has been little evidence of a fundamental change towards Education for Sustainability, especially in engineering education. Engineering has received increasing global attention as the discipline in which holistic and transformative approach to education could make significant contributions to more sustainable futures. In Vietnam, it has been regarded as being crucial for the socio-economic development, industrialisation and modernisation processes. There is, therefore, an urgent need to assess and act upon the current practice of engineering education to ensure it meets the new and challenging demand.

Through reviewing the state of play in Vietnam, the paper assesses the implications for Engineering Education for Sustainable Development (EESD) and identifies the components that constitute change towards a transformation of the current engineering curriculum for sustainable development. The findings were drawn upon empirical data from the first stage of a doctoral study which surveyed a broad range of stakeholder groups in Vietnam including governmental authorities, non-governmental organisations, engineering business and universities.

The paper then outlines a plan which seeks to explore ways of transforming the engineering curriculum in response to the challenges of Sustainable Development in Vietnam. The focus of this next stage will be on identifying opportunities and obstacles to curriculum transformation in Vietnamese engineering universities. It will also critically assess contextual and cultural factors with a view to understanding the influences over the desired change. A key outcome will be the development of a framework for supporting the transition towards education for sustainability in engineering universities in Vietnam. The study is seeking to identify culturally appropriate strategies for transformation of the engineering curriculum for sustainable development. The research aims to contribute to the growing body of literature on how to transform education towards sustainable development worldwide.

Keywords

Education for Sustainable Development, Engineering Education, Transformation, Culturally appropriate strategies

ASSESSMENT OF WHETHER THE INCLUSION OF AVIATION WITHIN THE EUROPEAN UNION'S EMISSIONS TRADING SCHEME CAN DRIVE THE AVIATION INDUSTRY TOWARDS A SUSTAINABLE FUTURE.

Holly Preston

Dalton Research Institute, Manchester Metropolitan University, h.preston@mmu.ac.uk

Abstract:

Aviation traffic has seen a significant increase over the last two decades with total scheduled traffic growing at an annual rate of 4.4% and passenger traffic expected to grow at an average annual rate of 4.8% beyond 2030. The emissions produced by aviation contribute to the forcing of the climate; most importantly the emissions of CO2, NOx, water vapour, aerosols, and the effects of contrails and contrail-cirrus. Despite improvements in technology, traffic growth rates result in increased emissions, which is potentially unsustainable within the context of stabilizing the Earth's climate to no more than 2°C above pre-industrial levels; a target which has been adopted by some national governments and the European Union (EU). Aircraft emissions were not included within the binding targets of the Kyoto Protocol, and the industry has received attention from commentators demanding it be subject to emission reduction policies. With the Kyoto Protocol's commitment period ending in 2012, and a potential successor still in development, policies to mitigate the climatic impacts of the aviation industry are starting to be employed. One such policy is the inclusion of aviation within the EU's Emissions Trading Scheme (EU ETS). This study investigates whether the inclusion of aviation within this market-based mechanism has the potential to significantly reduce aviation emissions and contribute to a sustainable future under the premise of climate stabilization. Firstly, the emissions that would be covered under the EU ETS only make up approximately 20% of global aviation emissions. This paper updates a DEFRA commissioned study on the allocation of international aviation emissions for the year 2000 to specific countries; updating it for 2006. The updated study showed that for 2006, the total global emissions from international aviation for scheduled flights, was approximately 561,000 Gg of CO2. Approximately one fifth of these emissions were attributable to flights to and departing from the EU-27 countries. Therefore, a considerable proportion of global emissions are unaddressed. Secondly, only the emissions of CO2 are covered under the EU ETS, meaning the climatic impacts of non-CO2 emissions will not be addressed. If the aviation industry is to move towards a sustainable future, the climatic impacts of these additional gases will need to be taken into consideration. Thirdly, the gradual decrease of the emissions cap under the EU ETS may not provide significantly meaningful emissions reductions in a fast enough time frame. Fourthly, there is the risk that the financial cost of trading in carbon credits will be passed onto passengers through ticket pricing, meaning that there will be a limited impetus upon the aviation industry to focus more attention upon reducing its carbon emissions, developing technologies, and changing practices. Additionally, only routes under the EU ETS will be affected, meaning that if there is any impact upon passenger numbers due to an increase in air fares, its impact on a global scale will be minimal. Therefore the potential of emissions trading could be more effective through implementation on a global scale through the linking of different ETS. This study therefore concludes that whilst the inclusion of the aviation sector within the EUETS is a positive climate mitigation policy, there are a number of issues that could hamper its success in contributing to a sustainable future.

Keywords

Emissions Trading Schemes, Climate Stabilization, Aviation emissions

MOVING THE AVIATION SECTOR TO A MORE SUSTAINABLE FUTURE: THE IMPORTANCE OF STAKEHOLDER PARTICIPATION IN AIRPORT MASTER PLANS

Rebecca Wiles

Dalton Research Institute, Manchester Metropolitan University, r.wiles@mmu.ac.uk

Abstract

Airport growth is a highly controversial process with communities becoming increasingly aware of the negative impacts airport operations have on the local and global environment. If the air transport industry is to grow sustainably it must meet the needs of society and contribute to the economy whilst preventing damage to the environment. In response to this challenge, the Department for Transport published the 2003 White Paper: The Future of Air Transport, which stated that airports forecast to have a minimum of 20,000 air transport movements by 2030 were expected to produce and maintain a master plan document detailing development proposals and their impact on the community and environment. In 2004 guidance was published stating that airports should engage with stakeholders during this master plan process, thereby facilitating a range of stakeholder groups' involvement in development processes with the aim of balancing local concerns with national interests. This emphasis on public participation is intended to enhance the quality and sustainability of planning documents through increased transparency and the subsequent establishment of public trust, thus reducing the likelihood of stakeholder opposition and any potential future community conflict. As such, it is an activity which should be included within both airport planning procedures and master plans. However, public participation is open to wide interpretation and has historically often been absent from planning procedures or included as an add-on process. This research critically assesses the quality of stakeholder participation within the master plan processes employed by the airports owned and operated by BAA plc and Manchester Airport Group in order to identify areas for improvement and determine the potential contribution to sustainable development. The effectiveness of the participatory techniques employed within the master plan processes were evaluated by reference to the best practice that has evolved from the application of environmental planning procedures such as Environmental and Social Impact Assessments and Strategic Environmental Assessments. This paper presents an analysis of documentary evidence supplemented by data drawn from interviews with airport stakeholders, which has enabled a number of key findings to be identified. First, the stakeholder engagement methods employed during the master plan process were both tokenistic, participants were informed of development plans but not able to influence them, and only partially completed. Secondly, the guidance provided was incomplete and left scope for interpretation, which could explain the varying levels of public engagement. Thirdly, there appears to have been little utilisation of the public engagement good practice developed in other environment assessment regimes. Therefore, whilst corporate programmes such as master plans can help drive the sector towards a more sustainable future, there is significant room for improvement. Future master plans offer an opportunity to address previous limitations by adopting good practice that enables more interactive stakeholder engagement; but this will require airports to relinquish some control over the planning agenda, provide more opportunities for stakeholder input and demonstrate greater receptivity to the modification of their plans. If this change in airport behaviour is widely adopted it could enhance the process of stakeholder participation, facilitate more proactive and inclusive engagement, and thereby enable more sustainable planning outcomes.

Keywords

airport, stakeholder engagement, master plan, environmental assessment procedures

TO INVESTIGATE HOW SMALL TOWNS IN ENGLAND CAN MOVE TOWARDS ENERGY INDEPENDENCE

Rhona Pringle

Newcastle University, r.pringle@newcastle.ac.uk

Abstract

There is little doubt that climate change is occurring and that the rate of climate change is a consequence of human activity. Globally a quarter of all greenhouse gas emissions come from the power sector. It is thought that in order for global temperature increase to be kept at or below the 2° C rise that could be adapted to, that the global power sector would have to be 60% decarbonised by 2050. If the target of an 80% cut in UK greenhouse gas emissions below 1990 levels by 2050 is to be achieved, as set out in the Climate Change Act 2008, a significant and rapid shift is needed to local production of renewable energy as part of the plan for climate change mitigation.

In England, 19.3% of the population live in rural areas, most of these in small towns. They make a significant contribution to the country's CO₂ emissions and have the potential to make a significant contribution to their reduction. Whilst there are some excellent examples of individual projects in small towns that are delivering locally produced, renewable energy supplies, there are few examples of whole settlement small town approaches to this in England. This study will seek to determine what the critical factors for success have been in small towns that have achieved/ are close to achieving energy independence in similarly developed European countries (e.g. Güssing Austria, Samsø Denmark and Växjö Sweden), what can be replicated and what new steps could be taken in small towns in England.

Energy independence here is defined as providing energy within/in the immediate locality of the small town using fuel sourced within/in the immediate vicinity of the town. The energy will meet the heating and power requirements of the residents, businesses, public and community/voluntary needs/facilities located within the settlement and its production will have no or limited impacts on human health and the functioning of ecological systems and the environment.

In her World Bank report, Ostrom (2009) surmises that Global collective action is unlikely to work and goes on to say that; 'To solve climate change in the long run, the day-to-day activities of individuals, families, firms, communities and governments at multiple levels – particularly those in the developed world - will need to change substantially'.

Given experiences in potential European case study settlements and Ostrom's polycentric approach outlined above, the research will look at how replicable methodologies are for small towns in England to move towards energy independence and will seek to understand the contribution/role in this of:

- 1. Governance at a Local, National and EU level
- 2. Planning & Policy
- 3. Funding
- 4. Research
- 5. Community
- 6. Leadership
- 7. Energy sources/use of technology

Key research questions

- Who are the key actors in energy independent small towns, how do they become engaged/sustain their engagement in this?
- What financial models are there for developing energy independence and how replicable are they for small towns in England?
- How are lessons learned/shared? Are there benefits for neighbouring communities/areas?
- Are there any unforeseen benefits/disadvantages?

Keywords

energy independence, small towns, governance, climate change, communities

THE ROLE OF ENERGY SERVICE COMPANIES (ESCOS) IN THE TRANSITION TO A LOW-CARBON UK ENERGY SYSTEM

Matthew. J. Hannon

Sustainability Research Institute, University of Leeds, Leeds, eemjha@leeds.ac.uk

Abstract

In order to help the UK achieve its target of reducing levels of Greenhouse Gas (GHG) emissions by 34% by 2020 on 1990 levels, both incumbent and new entrant companies are exploring the potential for radical changes to traditional business models for energy provision. One type of organisation that encapsulates this development is the Energy Service Company (ESCo). This research explores how important the adoption of this alternative business model could prove to be in a transition towards a low-carbon UK energy system and investigates the factors that are likely to inhibit or enable ESCos' contribution.

ESCos present an alternative business model for energy delivery to that of traditional energy supply companies. Instead, remuneration is coupled with the level of energy savings they achieve for their customers, both in terms of reducing the energy throughput required to fulfil their energy needs and reducing the associated costs of fulfilling these needs. These savings are delivered through implementation of a combination of energy efficiency and renewable energy generation measures.

This research investigates the *number* and *type* of ESCos that are likely to emerge in the UK by identifying the key factors that are responsible for driving and inhibiting their growth, as well as those that determine their organisational structure. For example, it will explore factors associated with the regulatory, socio-technical and institutional environment that ESCos operate in. Finally, this research explores the potential role ESCos could play in different transition pathways to a low-carbon UK energy system and how important their contribution could be to this systemic transition.

Keywords

ESCos, low carbon transition, UK.

ECOTOURISM: AN ALTERNATIVE FORM OF GREEN INDUSTRY FOR A SUSTAINABLE FUTURE IN CHINA

Shen Zhen Fen

Kings College London, zhenfen shen@hotmail.com

Abstract

Ecotourism has been claimed as a tool to achieve sustainable development in the majority of existing ecotourism literature. This paper argues that ecotourism with effective management and planning strategies can contribute to the Greening of industry in China. A case study of Hong Kong Wetland Park demonstrates the way in which ecological modernization is utilized to minimize environmental impacts. One facet of this is the integration of innovative scientific management and advanced technology to reduce impacts on the external environment. Examples include various recycled materials, renewable energy, advanced technological facilities (for example a Geothermal Heat Pump Air-Conditioning System) are integrated into the Park in order to reduce material and energy consumption. The Park also adopts scientific management strategies such as the park zoning system and the concept of carrying capacity with an aim to effectively manage tourist presences in the Park without undermining the goal of environmental conservation.

The other facet of ecological modernisation is environmental education, which is adopted as an effective tool to convert tourist experiences into 'transformative values' which encourage changes in tourists' behaviour and lifestyles and the adoption of more environmental-friendly practices and therefore secure a sustainable future. One of the key objectives of the Park is to provide the public's education on environmental knowledge and to facilitate public awareness in protecting and safeguarding natural resources. Multi-media facilities and interactive computer games are provided in the Park aim to better convey environmental knowledge to the tourists. The Park also launches a series of school programmes and events which encourages participants to actively take initiative to safeguard the natural environment.

Therefore, in order to achieve a sustainable development strategy, it is argued that it is necessary to 'Green' both external environments and the tourists' mind and lifestyles. This study has potential practical value, in that it might be feasible to use the theoretical framework identified in the case study of Hong Kong Wetland Park to develop management and planning strategies for other tourist sites which are increasingly looking to ecotourism as a 'Green' development strategy. In particular, in recent years ecotourism has been gaining great popularity in China. More and more tourist projects labeled with 'eco'or 'green' have emerged today. Correspondingly, there is a heated debate about whether those 'eco/green' projects are indeed contributing to the Greening of the tourism industry by incorporating sound sustainable principles or are they only adopting its facade, without making fundamental changes to conventional tourism practices. Nevertheless, by demonstrating how ecological modernization can be applied to Hong Kong Wetland Park to achieve 'Greening', both environmental externalities and shifts in tourist perceptions, it concludes that ecotourism with proper management and planning can be regarded as an alternative form of Green industry contributing to a sustainable future.

Keywords

Ecotourism; Ecological Modernisation; Green Industry; Sustainable Development

BRINGING SUSTAINABILITY ECONOMICS OUT OF THE BLACK BOX AND INTO THE PUBLIC: A MODEL OF FUTURE EMPLOYMENT FROM THE BOTTOM UP

Andrés Bucio

School of Environmental Sciences, University of East Anglia, a.bucio@uea.ac.uk

Abstract

What does a country look like after cutting its greenhouse gas emissions by 80%? How does it maintain jobs while phasing out the high-energy-density contents of oil? Is immigration good or bad? To understand how economic policy is compatible with a transition to sustainability, analysts often refer to 'decoupling' the economy from environmental impacts and to 'capital substitution': the degree to which man-made and natural capital are believed to be substitutes or complements in a sustainable economic scenario. The idea of substitution is a potent one indeed: it shapes institutional perceptions about what the interplay between intangible value and the tangible world could be, or should be; it provides the ethics and ideals upon which people create their own views about the future. Because substitution potential needs to be understood empirically, and yet, in relation to things that will only happen in the always receding future, substitution discussions have come to a conceptual standstill. This paper sets out to explain how deceptive we should expect our current 'top down' models of substitution to be (both 'weak' and 'strong' sustainability positions) and proposes a 'bottom up' empirical model of substitution based on green employment possibilities. It first explains why the division between 'man-made' and 'natural' capital is obsolete and points at three empirical problems resulting from such a division. The first problem is that the current substitution framework is unable to reflect the cultural and technological convergences of the twenty-first century. 'Borderline' forms of capital have been emerging in much more enigmatic ways than categories of man-made or natural capital allow us to see or understand (e.g. are GM crops, natural or intellectual capital?). Most analysts have focused on the engineering intricacies of substitution (e.g. raw materials, efficiencies). Yet, such an approach will soon be dwarfed by the formidable tangible-to-intangible substitution potential posed by the interplay between bits, atoms, neurons and genes of converging technologies, in particular biotechnology (the ability to substitute plants functions), nanotechnology (the ability to substitute matter) and artificial intelligence (the ability to substitute the functions of the human brain). The second problem is that no adequate attention is being paid to how the material and immaterial worlds interact within the market to deliver -- or ruin -- our chances to achieve sustainability. There appears to be a problem with trying to define and protect 'critical natural capital' as if it had some sort of isolation status from the often destructive terms of trade between the market place of ideas and the market place of natural goods and services in a so-called 'knowledge based economic system'. The third problem is that assuming 'man-made capital' as 'man-controlled capital' is no longer a realistic or useful simplification of reality in any scenario of the future. To be sure, sustainability economics may well need to start readdressing substitution as the interplay between 'critical forms of capital' and 'runaway' forms of capital. Taking the aforementioned as footing, the paper then outlines an empirically-based model of capital substitution 'from the bottom up' where the relevant unit of analysis is no longer the macro economy but the 'green worker' (understood as one who has access to three critical forms of capital). A notion of 'green employment governance' is also put forward. The paper discusses briefly how the model has been applied to future scenarios of capital substitution based on green employment possibilities and provides some concluding comments in regards to the implications of a bottom up approach for collective efforts in future scenario making.

Keywords

Capital theory approach, sustainable employment, substitutability, future scenarios, critical capital

WHY BIODIVERSITY MATTERS TO YOU AND ME, AND HIM AND HER.

Amy McDougall

Tyndall Centre for Climate Change Research, University of East Anglia, <u>a.mcdougall@uea.ac.uk</u>

Abstract

Biodiversity is the variety of life on Earth, its decline is not only to be lamented as the loss of a few species, but is of great concern to our global society. Biodiversity forms the bedrock of natural processes upon which healthy ecosystems are maintained. Healthy ecosystems provide us with food, fuel, medicines and fibre, to name but a few of these processes commonly labelled ecosystem services. There is a significant risk that as species disappear from their ecosystems these delicately balanced systems will collapse, and no longer provide the services upon which we rely. For example, without forests to maintain local climate and rainfall patterns, insect pollinators to pollinate our food crops, mangrove trees to protect coastlines from extreme weather, we are left less resilient to environmental change. In the developed world, many of us have lost direct contact with nature's services, but without this provision, we may struggle to support our lifestyles.

My project aims to provide insights into how biodiversity will be affected by environmental change in to the future, specifically how climate change will translate into changing patterns of biodiversity or the loss of biodiversity across the world. This involves using future climate projections coupled with species distribution modelling. Species distribution models use current knowledge of where each species occurs combined with a suite of climate variables, such as average yearly temperature, to predict the species current distribution. These predictions are then coupled with climate models to predict the species future distribution. Using different emission pathways, including the business as usual SRES_A1B scenario and the AVOID stringent mitigation scenarios, which cover different peaking dates for global greenhouse gas emissions and levels of mitigation, allows us to compare future patterns of biodiversity depending on the pathway we follow.

The predicted changes in distribution for individual species can be used to give an overall picture of how biodiversity patterns will change into the future. They can help to inform conservation policy as to the best plan of action for maintaining biodiversity functioning and the beneficial ecosystem services they provide- helping us to secure a more sustainable future. The use of the AVOID stringent mitigation scenarios shows the benefits of climate mitigation in terms of preserving our ecosystems and their services, which is a key component of sustainability.

Keywords

Biodiversit, Ecosystem Health, Ecosystem Services, Climate Change, Modelling

ACHIEVING SUSTAINABLE RECONSTRUCTION AFTER DISASTERS: THE EFFECTIVENESS OF HUMANITARIAN RESPONSE IN NIAS ISLAND, INDONESIA

Ugo Guarnacci

University of Reading, U.Guarnacci@pgr.reading.ac.uk

Abstract

The number and seriousness of disasters is globally increasing, disproportionately affecting poor countries and exacerbating people's vulnerability.

In such a context, sustainable reconstruction has emerged in the international arena as an effective strategy to address the issue of sustainability during the recovery process. The main idea behind this approach is that reconstruction does not simply imply restoring life to pre-disaster conditions. In this light, well constructed buildings and a safe and sustainable environment become elements to promote a culture of prevention and to achieve long-term community resilience.

The purpose of the presentation will be to critically discuss to what extent humanitarian response has been effective in achieving sustainable reconstruction after the December 2004 tsunami and subsequent March 2005 earthquake in Nias Island, Indonesia. By linking the approach of sustainable reconstruction with the discourse on the effectiveness of humanitarian intervention, the presentation will attempt to highlight the main challenges faced by international and local organizations in dealing with disasters in a sustainable way. Moreover, it will examine how the theory and practice of sustainable reconstruction are experienced on the ground.

Keywords

disasters; sustainable development; reconstruction; effectiveness; humanitarian response; Indonesia.

DISASTER MITIGATION STRATEGIES IN A SYSTEM OF TWO ASYMMETRIC CITIES BASED ON LAND USE AND TRANSPORT POLICY PERSPECTIVE FOR SUSTAINABLE DEVELOPMENT

Fahmi

Institute for Transport Studies, University of Leeds, tsfa@leeds.ac.uk

Abstract

In developing countries, the lack of planning in rapid development with high growth population has contributed to an increase of vulnerability for the cities, which are physically located in disaster prone area. Relocation strategies by banning the residential area in high risk area and decentralized concentration by transforming a single centre pattern into a multiple centre pattern are the alternatives for reducing the hazard vulnerability in the high risk city. However, these policies would affect the energy use in urban area that is governed by urban structure pattern and transport infrastructure. In previous studies, there are little research concerns on how the dynamic of land use and transport planning interaction in such transformation context. This research will explore the transport impact on such transformation based on reviews of previous modeling effort in some countries and how the negative impacts of such transformation can be reduced.

There are four dimensions considered in this research. First, it is related to the spatial planning policies in disaster mitigation strategies (settlement or trip attractor relocation). Second, it is related to the transformation of urban structure pattern as a result of re-adjustment planning in the context of the first dimension (monocentric to bicentric or polycentric). Third, the land use policies (tax and urban growth boundary) for supporting the transformation of urban spatial pattern. Fourth, transport policies that would reduce the negative impact of such transformation.

The policies selected will be tested by presenting a case study on the dynamic application of land use and transport plan interaction in a system of two asymmetric cities. (Banda Aceh and Aceh Besar, Aceh, Indonesia), which are located in disaster prone area. Banda Aceh city as a coastal urban environment faces the problems with the increase of new housing development in high risk area and urban sprawl that leading to its neighbor city.

A modeling simulation will investigate the transport impact on the policies selected in disaster mitigation strategies context with respect to the transport performance indicators in a system of two asymmetric cities. In simulation process, the dynamic of land use and transport plan interaction will be simulated by applying opposed zoning land use policies, relocating some trip attractors from higher risk to lower risk city and promoting public transport system.

Currently and in the next future years, the coastal cities environment in the world would be more vulnerable to the disaster (i.e. sea-level rise, flood or tsunami issues). Thus, it is needed the urban spatial re-adjustment for reducing the hazard vulnerability with respect to the transport performance indicators in the framework of sustainable development. Therefore, the results in the case of study of this research are highly possible to be transferred to the other coastal cities in the world that will face the same problems.

Keywords

mitigation disaster, relocation policy, spatial planning, transport impacts

DISASTER RISK REDUCTION, CLIMATE CHANGE ADAPTATION, AND INSTITUTIONS: TRANSFORMING COPING CAPACITY TO ADAPTIVE CAPACITY IN UGANDA

Rachel Berman

Sustainability Research Institute, University of Leeds, lec5rjb@leeds.ac.uk

Abstract

This poster investigates the policies, institutions and processes, "PIPS" that enable or constrain disaster risk reduction (DRR) activities resulting in adaptation to climate variability. Adaptation to climate variability is understood as comprising of two levels: short term coping capacity, and longer term adaptive capacity. Past research into adaptation to climate variability has analysed this coping capacity in detail as well as suggesting requirements for adaptive capacity. However, only recently has it been recognised that we need to understand how this adaptive capacity is generated. The gap in understanding how and why coping capacity to short term hazards is not immediately transformed into adaptive capacity to longer term vulnerability, and identifying the barriers and constraints that PIPs present to this through disaster risk reduction activities will be addressed in this research.

This research focuses on Uganda, specifically the districts of Kasese and Kabarole in the south-west, which are prone to both floods and droughts. Many livelihoods in this area are dependent on sectors that are sensitive to climate variability, and this is exacerbated by poverty, ecosystem degradation and complex disasters. This research uses a mixed-methods approach, comprising of initial key informant interviews and baseline surveys, followed by a quantitative social network analysis and agent-based modelling process. This will enable an investigation into the risks perceived to be experienced by the community, the coping strategies currently relied on, and institutional enablers and constraints to the emergence of adaptive capacity.

In summary, this work will investigate what barriers in both structures and processes need to be overcome in order to enable adaptive capacity to be generated and developed. In turn, this will significantly progress out understanding for future climate policy, and understanding how vulnerable communities in developing countries are able to make sustainable choices that build their adaptive capacity to climatic hazards and reduce their long term vulnerability. In addition this will provide important lessons for how communities and society cope with future uncertainty to other environmental and social challenges.

Key words

disaster-risk reduction, adaptive capacity, climate change, institutions

THE ROLE OF EDUCATION FOR SUSTAINABLE DEVELOPMENT IN FAMILIES' SUSTAINABLE CONSUMPTION

Georgios Zampas

Sustainability Research Institute, School Of Earth And Environment, University Of Leeds, <u>ee09g2z@leeds.ac.uk</u> Web: <u>http://www.see.leeds.ac.uk/people/g.zampas</u>

Abstract

The main aim of this paper is to bring concepts of Sustainable Consumption and Education for Sustainable Development under a common 'umbrella'; to examine the impact of a programme of Education for Sustainable Development and how it can communicate the message of a lasting pro-environmental behaviour to students, and in turn if and how such a programme can influence the lifestyles of children's families. In essence, this is an evaluation of the secondary effects of an environmental education mechanism; which asks if the rise of students' environmental concern and action and their ability to influence their family members in terms of awareness, concern and action; towards more sustainable lifestyles.

The contribution of this work is to explore the influence of two different age groups, children and adults; through the intergenerational and intrafamily relationships. Focusing on children's contribution to put the environmental 'damage' on hold has resulted in the contention that it is a waste of time to wait until they come of age and take serious action and that a focus on adults would be more effective. The answer to this argument, given through this paper, is that by focusing on children there is a possibility that we can create the environmentally conscious adults of the future and simultaneously; we can influence the adults of the present; as it is known, that children have a more active role in families' decision-making processes now than before. So, this paper will focus on the connections between Education for Sustainable Development and Sustainable Consumption. This connection has social and educational outcomes or in other words outcomes that regard doing and learning respectively.

The methodology followed here was a mixture of qualitative and quantitative approaches. Interviews with experts like policy makers and members of academia who work in the area of Education for Sustainable Development, consultants on the Sustainable Schools Strategy as well as teachers and heads of schools of the United Kingdom were held.

After having chosen the case studies (two classes in two different primary schools in the United Kingdom), a participant observation in the classroom is taking place and questionnaires are being handed out to students and parents, and then semi-structured interviews with the families and focus groups and brainstorming groups with students will take place, discussing the motives and sources of influence in terms of the adoption of sustainable practices in their everyday life. There are not any specific results yet, since the data are currently being collected; but by the time of the conference I will have more to say.

In a nutshell, this paper examines whether the cooperation of different generations for environmental protection and sustainability is occurring, as a result of Education for Sustainable Development (ESD); and if so what is its impact on Sustainable Consumption (SC). So, this paper presents the links and overlaps between ESD and SC, as they have been identified through original empirical research with teachers, students and their families, in the United Kingdom.

Keywords

Sustainable Consumption, Education for Sustainable Development, Sustainable Lifestyles, Families

Jafar Ali

University of Huddersfield, j.ali@hud.ac.uk

Abstract

The current architectural trend is to build large complexes and manage them centrally. Numerous commercial organisations occupy small spaces in large office blocks where computing facilities are common – all generating heat. To control overall building temperatures it is a necessity to include a cooling system in the building plans at the outset. Traditional air conditioning makes use of chillers to cool the system but if the building is located in close proximity to a British Waterways canal then an environmentally friendly alternative may be available. BW estimates an additional 1000 businesses on canal sites could use canal water for cooling purposes. According to British Waterways official web site this will result in a saving of £100 million on annual energy bills and a reduction of carbon dioxide emissions by 1 million tonnes each year. This value is equivalent to 400,000 family sized cars being taken off the roads. New applications for proposed abstraction and discharge licenses are assessed and authorised by BW and are regularly monitored by the local Environmental Agency for compliance with the license and other appropriate environmental regulations.

This Study uses a thermography technique to predict heat diffusion profile of thermal water discharge into rivers and canals using thermal camera. It's provided thermal images for the surface of receiving water showing clearly the mixing zone, shape of plume and edge of plume which have been difficult to predict by mathematical models. The process applied on number of real canal sites and in laboratory to observe the actual thermal discharge. To verify the accuracy of the thermal images, the obtained data are compared with temperature measured by thermocouples on canal sites. In addition a laboratory experimental tank is built to replicate the canal sites that allow the study to be taken under variable conditions. The centerline temperature decay obtained from thermal images agreed with temperature measured by the thermocouples. This paper will be of interest to practicing engineers who deal with environment

Keywords

Heat diffusion, plume, pollution, thermal image.

TOWARDS A SUSTAINABLE FUTURE: THE POTENTIAL OF BIOMIMICRY

Sanne van der Hout

Radboud University Nijmegen, Department of Philosophy, Centre for Society and Genomics, svdhout@science.ru.nl

Abstract

This paper critically assesses the role of 'biomimicry' in assuring a more sustainable future for the earth. Since the end of the 20th century, we have become increasingly aware of the earth's vulnerability to human interventions. Reports such as *The Limits to Growth* (Club of Rome, Meadows et al. 1972) have confronted us with the finiteness of natural resources. Besides this confrontation with the earth's boundaries, we have discovered that the mechanisms and processes of nature are much more intricate than we ever imagined.

According to various contemporary environmental thinkers, these two insights into the dynamics of nature have transformed the character of modern technologies. Compared to traditional technologies, modern technologies - for instance nanotechnology and metagenomics - take into consideration nature's own processes to a far greater extent. Rather than counteracting these processes, they are inspired on nature's own course. To describe the analogy between the mechanisms of nature on the one hand, and the dynamics of contemporary human technologies on the other, a number of scientists, including the American biologist Janine Benyus and the French chemist Clément Sanchez, use the term 'biomimicry', derived from the Ancient Greek terms *bios*, meaning life, and *mimesis*, meaning to imitate. The German philosopher Peter Sloterdijk refers to this analogy with the term 'homeotechnology', derived from the Ancient Greek *homoios*, meaning like or similar. According to Benyus, we can use the earth's resources in a much more sustainable way if we can allow our human world to function like the natural world. One of Benyus' examples of biomimicry is the invention of a better solar cell by studying how a leaf captures energy (Benyus 1997).

In this paper, I will argue that biomimicry (homeotechnology) has great potential to contribute to a more sustainable future for the earth. Some of its assumptions, however, need to be challenged. Firstly, the vanishing of the boundary between natural and man-made designs does not automatically result in more nature-friendly forms of human intervention. On the contrary, it might at the same time lead to an even more radical intrusion of humans into nature, for instance by opening up new possibilities for (genetic) modification. A second challenge of biomimicry is that it needs to broaden its perspective from predominantly *technological* to a mode of thinking that includes *social, political* and *cultural* dimensions. As the Australian environmental philosopher Val Plumwood argues, 'Technofix solutions make no attempt to rethink human culture, dominant lifestyles and demands on nature [...] But we did not just stumble by some freak technological accident into the ecological mess we have made, and it will take more than a few bright boys and better toys to get us out of it' (Plumwood 2002). This paper investigates how the sustainable potentials of biomimicry could be realised.

Key words

biomimicry, environmental philosophy, sustainability, homeotechnology, ecofeminism

Voting sheet for best presentation in each session - please mark only one in each session that you attend

Wednesday 30 th March					
Session 1 (10:30–11:30) Built e		Built e	nvironment		Best in Session
1. Best Philip James University of Manchester			Delivering the low carbon built environment: the need for innovative models of finance and service-provision		
2. Katherine Brookfield University of Southampton		n	Localism and planning – pathway to a sustainable future?		
3. Edward Byers University of Newcastle			Analysis of and transition strategies for sustainable infrastructure futures		
Ses	Session 2 (11:30–12:30) Behaviour				
1.	Rachel Howell, University of Edinburgh		Promoting lower-carbon lifestyles: change change	processes and stages of	
2.	2. Julie Sawyer Loughborough University		Global warming and heated climates in the blogosphere		
3.	 Malek Al-Chalabi University of Oxford 		Travel Transitions: a journey from the past and Implications for the future		
Ses	sion 3 (17:00–18:00)	Gover	nance and industrialised countries		
1.	Lauren Roffey University of East Anglia		Privileged actors in environmental policym aviation industry in the UK	aking? A case study of the	
2.	2. Leonie Dendler University of Manchester		Sustainability product labelling: a means to support more sustainable consumption and production?		
3.	3. Tom Cohen UCL		Can participatory emissions budgeting assi climate change?	st authorities in tackling	
Thursday 31 st March					
Session 4 (09:10–10:10) Impac		Impac	ts and resilience		
1.	James Waters University of East Anglia		The role of ecosystem services in the resili areas	ence of rapidly urbanising	
2.	Rita Yu University of East Anglia		Climate change induced changes in extrem	e weather events	
3.	Helen Adams University of East Anglia		Climate and the decision to migrate		
Session 5 (10:10–11:10) Energy					
1.	Sadiq Ali Shah		Utilization of sustainable processes for dev	velopment in deserts	

1.	Sadiq Ali Shah	Utilization of sustainable processes for development in deserts	
	University of Manchester		
2.	Chris Jones	Nuclear district heating; or why we need to be bolder and more	
	University of Manchester	ambitious in order to change UK heat supply	
3.	Lucy Brown	Community reactions to biomass energy: power, planning and	
	University of Strathclyde	change in Scotland's 'City of Discovery'	

Session 6 (11:40–12:40)		Gover	nance and industrialising countries		_
1.	Ashish Aggarwal University of Manchester		Reducing emissions from Deforestation and degradation (REDD plus): an opportunity for multiple benefits or a proposal of multiple risks		
2.	Jenifer Hodbod University of East Anglia		Biofuels as a perturbation to the resilience multiple scales	of food systems at	
3.	Nina Hissen University of East Anglia		The ways in which climate change affects tr relations (TbWR) in the Nile basin	ansboundary water	

Ses	sion 7 (13:30–14:30)	Metho	ods for modelling the transition		
1.	1. Matthew Holmes Newcastle University		A method of generating geographic interdependence between critical infrastructure assets		
2.	2. Kevin Ummel Uni of Manchester (MESPOM)		Optimizing worldwide deployment of wind and solar power technologies via a high resolution, linear programming model		
3.	Evelina Trutnevyte University of Zurich		Opening up for plural visions of the ideal fu transitions	ture to intricate	



Elsevier prize for 'best presentation'

The Journal for Environmental Innovation and Societal Transitions (Elsevier Science) has generously sponsored a prize for the best presentation given at the Sustainable Futures Conference, 2011. The prize will be awarded to the researcher whose presentation best embodies the spirit and aims of the conference.

Voting

All conference delegates are invited to help the conference in selecting the prize-winner, by voting for the presentation in each themed session that they think most closely meets the following criteria:

- 1. Articulates a vision of, or way of envisioning / pursuing, a 'sustainable future'
- 2. Asks questions about what changes to our current structures and paradigms might be needed if we are to cross the divide between 'where we need to be' and where we are headed
- 3. Reflects on the role that researchers have to play in affecting that future.

On the voting sheet overleaf place a tick next to the *one presentation in each session* that you think best exemplifies these qualities. (Up to seven presentations in total, if you attend all sessions. We would ask that you please don't vote for a session if you don't attend it.) While of course presentation style and delivery are important factors too, we suggest that you keep the above criteria in mind when making your vote.

Please hand your voting sheets to a member of the Manchester organising team (wearing coloured name badges) during afternoon coffee on Thursday, or at any time before if you are leaving early.

The results of the whole conference vote will be deliberated by an impartial jury, who will pick one winner from the seven best-in-session finalists.