UCD Earth Sciences Institute

Earth & Natural Sciences PhD Programme 2011

Strand 6:

Economics & Policy Analysis

Project Descriptions (v6)

Please Note:

While every effort has been made to ensure that the information contained within this document is accurate, it is possible for errors and omissions to have occurred. It is strongly recommended that potential students make contact with the Principal Investigators directly, should they have any questions about the projects.

Introduction 4

Information on the Application Process 5

List of Projects

1	*An economic analysis of renewable electricity generation from community wind farms in the Irish uplands*	6
2	*Adapting to Climate Change: The Regulatory Response*	8
3	*Geospatial Technology and Infrastructure for Evidence-Based Planning and Policy in Flood Prone Areas*	9
4	*Land use modelling to optimize bioenergy supply chains in Ireland*	10
5	*Improving the evidence base for policy decisions affecting the sustainability of transport-land-use relationships in the Dublin Regions*	110

Introduction

The ENS PhD Programme

The global change in climate and energy supplies will have a major impact on the island of Ireland, on how our economy evolves and the need for measures to protect our environment.

UCD is harnessing its considerable resources to address the challenges by developing an Earth Sciences Institute (ESI). The proposed ENS PhD programme building on the concept that energy and environment are co-dependent, draws on the unique range of disciplines and technologies of UCD, ESI and its partners to create new programmes in Earth and Natural Sciences education. The proposed ESI PhD programme will create a cohort of graduates with a strong background in Energy and Environmental studies, imbued with the innovation and entrepreneurial skills to develop an emerging green technology sector. In addition to a core of postgraduate students specialised in key elements of earth sciences, the programme will impact across a wide range of undergraduate and graduate programmes. It is only by influencing the collective skills of future graduates emanating from a range of disciplines that we will as a society adapt to the national and global challenges and opportunities in agriculture, energy, food, forestry, green technology, land resources, nanoscience and water.

This Strand – *Economics & Policy Analysis* – aims to produce graduates that: understand how to interface effectively with scientists; effectively work with agencies and government or enterprise; support innovation and enterprise.

Strand Keywords: environmental policy, economics, law, business studies, political science

Information

The Application Process

Please read the following section very carefully. It is of the utmost importance that all the relevant documents are submitted as part of a single email application. Incomplete applications will not be reviewed.

If you have any specific questions about the project or the application, please contact the Principal Investigator directly (details are available in this booklet).

Applications should be emailed to both the Principal Investigator for the specific project and to ens_phd@ucd.ie. The subject line should contain the word "Application" followed by the project number followed by the applicant's name (e.g. Application ECO 4 Joe Bloggs).

Mislabeled applications may not be processed.

All applications must include the following documents:

1. A completed Application Cover Form (download)
2. A complete Curriculum Vitae
3. A Letter of Motivation outlining your interest in the specific project
4. Certified copies of academic transcripts

and, where appropriate,

5. Evidence of proficiency in English

All documents should be typeset or scanned, as appropriate. Please provide PDF format documents where possible.

Please note that all elements of the application must be included in one email. It will not be possible to process incomplete applications and we will not be in a position to collate applications sent in separate emails.

Failure to include all of the documentation listed above will result in your application being rejected.

Applications received before **13 May 2011** will receive full consideration, and the positions will remain open until filled.

Project ECO 1

An economic analysis of renewable electricity generation from community wind farms in the Irish uplands

Principal Investigator: **Dr Thomas van Rensburg** (NUIG) – thomas.vanrensburg@nuigalway.ie
Collaborators: **Hugh Kelley**

This study applies mean-variance portfolio theory to an analysis of renewable electricity generation from community wind farms in the Irish uplands. The provision of renewable electricity from community wind farms in Ireland has been designed without an analytical assessment of its profitability or risk. The implication is that policy makers in Ireland cannot adequately assess the impact of the renewable energy sector, particularly energy from wind farms on future energy supply and electricity price. Ireland's mix of energy generating technologies is heavily dominated by fossil fuels including peat, and is especially vulnerable to fuel price increases, supplies from abroad and cuts in supply. This study evaluates the potential contribution from community wind farms in upland areas of Ireland. Notably the study considers both market and non-market effects. It also uses spatially modelling techniques for energy planning. The study examines the impacts that a number of renewable energy portfolios (REP) would have on the expected costs and risk of electricity generation. The MVP model will be used to identify optimal REP solutions, to evaluate their impact on energy cost-risk to the consumer.

Recent energy research of an economic and social nature in the RoI has focussed on energy conservation and on climate change not on the economic viability, risk and uncertainty associated with community wind farms. No studies in Ireland or elsewhere combine market and non market data to model and explain agent behaviour and evaluate risk and uncertainty with respect to the wind farm renewable energy sector.

This study employs portfolio theory (PT) modeling and simulation, stated and revealed preference survey techniques, and experimental economics methods to identify an optimal renewable electricity generation portfolio for Ireland. The study will quantify the various environmental risks including impacts on local landscape and biodiversity using stated preference choice modelling surveys.

Another critical element of the energy generation issues is the notion of space. We will explore the critical role of space in placement and distribution for renewable energy generation from community windfarms.

Study objectives

- To examine the profitability and risks of community wind farms in the Irish uplands.
- To quantify the external costs and benefits of community windfarms in the Irish uplands.
- To make policy recommendations to the Irish government and the private sector about the future development of community wind farms in the Irish uplands.

Broadly speaking there are a range of strategic benefits to the RoI including assisting the development of Ireland's Smart Economy, and to assist with the creation of a thriving enterprise sector and high quality employment. A number of communities involving farmers have proposed wind farms in many areas of the uplands. Many local SME's are developing novel components for sustainable energy devices (C and F tooling; EireComposites) as well as consultancy services. A key deliverable will be to communicate our findings to farmers as well as the industry.

The study will enhance NUIG's international standing through the publication of leading journals in the field. Scientific and socioeconomic dissemination will be based on an integrated programme of measures to well identified audiences, including academics, research scientists, policy makers, environmental planners and other local government officers. International dissemination will be achieved through publication of research papers in relevant journals and presentations and posters at international conferences. International journals targeted include: Journal of Environmental Economics and Management; Land Economics; Ecological Economics; The Energy Journal; Energy Policy; Renewable Energy; Sustainable Energy Reviews.

There is one studentship associated with this project and it will be based at NUIG

Project ECO 2

Adapting to Climate Change: The Regulatory Response

Principal Investigator: **Dr Suzanne Kingston** (UCD) – suzanne.kingston@ucd.ie
Collaborators: **Professor Colin Scott (**UCD**)**

While a significant amount of regulation is in place at the international, EU and national levels aimed at mitigating climate change, the regulatory response to adaptation has lagged far behind. The need to establish comprehensive adaptation programmes has been emphasized at international, EU and national levels (Copenhagen Accord (2009); European Commission White Paper on adaptation (2009); National Climate Change Strategy (2007 – 2013), but this has not yet happened in a comprehensive way.

This regulatory gap presents a major opportunity for a contribution from research. This project will focus on the emergence of regulatory policy initiatives developed in the adaptation context at home and abroad, considering the types of institutions, policy instruments and modes of governance best suited to delivering an integrated approach to climate change adaptation at national, EU and international levels. It will aim to understand the emergence of regulatory policy initiatives that have been developed in response to the climate change agenda, their nature and effects with a view to better understanding the limits and potential for such initiatives in Ireland. It will also consider the potential role of climate justice principles in evaluating such regulatory responses.

The project is interdisciplinary, and will be complemented well by the project led by Prof. Zorica Nedovic-Budic of UCD's School of Geography, Planning and Environmental Policy, which will examine the potential of geospatial technology and infrastructure for planning and policy in relation to flood-prone areas. While Prof. Nedovic-Budic's project will look at the potential of technology for informing planning and policy in relation to adaptation, the present project will focus on how this and other scientific information relevant to adaptation should best be operationalised in the context of institutional, policy and regulatory structure at national and international levels.

Dr. Suzanne Kingston researches in EU environmental law and economic law and has a strong track record of publications in leading peer-reviewed journals, with a monograph, Greening EU Competition Law and Policy, forthcoming from Cambridge University Press. Professor Colin Scott is a leading expert in regulation and governance theory. He has led a variety of projects addressing issues if regulatory capacity, most recently projects on regulatory capacity and networked governance in Ireland (funded by IRCHSS) and transnational private regulation (funded by the Hague Institute for Internationalization of Law). He is Director of the UCD Centre for Regulation and Governance.

There is one studentship associated with this project and it will be based at UCD

Project ECO 3

Geospatial Technology and Infrastructure for Evidence-Based Planning and Policy in Flood Prone Areas

Principal Investigator: **Professor Zorica Nedovic-Budic** (UCD) - zorica.nedovic-budic@ucd.ie
Collaborators: **Dr Debra Laefer (**UCD**); Professor Gerald Mills (**UCD**)**

This project will focus on geospatial technologies for land-use planning and development in flood-prone areas. Information and visualisation technologies, including geographic information systems (GIS), remote sensing (RS), global positioning systems (GPS), and image processing, among others, have supplied the methods and tools for collecting, managing, visualising and analysing spatial information, modelling urban growth and change, and facilitating assessment of impacts. Drawing on computer, information and policy sciences, the geospatial technologies will be integrated, accessed and utilised within spatial data infrastructure (SDI) framework which encompasses policies, fundamental data sets, technical standards, networks (technologies), and human resources (including users, providers, and value adding sectors) necessary for the access, delivery, and utilisation of spatial data at different political and administrative levels. A prototype SDI will facilitate evidence-based planning practice and policy, participatory decision-making and multiinstitutional collaboration in the exchange of data. Most importantly, it will allow for more effective addressing of flood hazards.

This project is timely to Ireland's effort to meet its 2019 EU obligations under the 2007 INSPIRE Directive for a European-compatible spatial database infrastructure (Infrastructure for Spatial Information in Europe, http://inspire.jrc.ec.europa.eu/). On 30 July 2010 John Gormley TD, the Minister for Environment, Heritage and Local Government, signed Statutory Instrument No382 -- the transposition of the INSPIRE Directive into Irish Law. The project also builds on the Office of Public Works National Flood Hazard Mapping (http://www.floodmaps.ie/index.aspx) and Irish Spatial Data Exchange (http://isdesearch.marine.ie/isdeportal/) initiatives, but provides a more comprehensive infrastructure that incorporates a wider range of geospatial tools and stakeholders involved in dealing with floodplains and flooding – whether they manage them or are affected by them. Finally, the recent update in the Irish spatial planning law -- the Planning and Development (Amendment) Act 2010 – calls for a closer attention to sustainable development practices and evidence-based planning (http://www.environ.ie/en/Legislation/DevelopmentandHousing/Planning/).

There is one studentship associated with this project and it will be based at UCD

Project ECO 4

Land use modelling to optimize bioenergy supply chains in Ireland

Principal Investigator: Professor Maarten Nieuwenhuis (UCD) – maarten.nieuwenhuis@ucd.ie
Collaborators: **John Finnian** (Teagasc); **Dagmar Haase** (HU Berlin); **Dr Tamara Hochstrasser** (UCD); **David Meredith** (Teagasc); **Mike Wilson** (SEAI)

Bioenergy can make a significant contribution to meet Ireland‟s 16% renewable energy target by 2020, but will likely compete with other land uses such as timber production. Potential bioenergy production is spatially variable and contingent on local combinations of soil, climate, topography, transport infrastructure and current land management.

The Sustainable Energy Authority of Ireland (SEAI) has developed a national spatial database of bioenergy potential according to geographic location (BGIS) and a Bioenergy Analysis Model (BEAM) used for the NREAP report. BEAM uses a very wide range of supply, demand, and transport economic data to determine the likely development of bioenergy in Ireland, however it is lacking both in spatial components and social parameters. BGIS and BEAM offer the unique opportunity for the Earth Science Institute to lead an interdisciplinary effort in evaluating different options for bioenergy supply chains for Ireland. Based on recent experience in land use modelling as acquired during the Urban Environment Project (UEP), we are proposing to develop a land use model that would incorporate BGIS, BEAM as well as socio-economic data from Teagasc (SMILE). Many suitable land use models have been developed internationally, such as the LUMOCAP model, which is based on the same principles as the model used in the UEP – the MOLAND model. The PhD student in conjunction with the Humboldt University Berlin (Prof. Haase) will evaluate which modelling framework would most efficiently take advantage of existing Irish models. In a second step the selected model will be adapted to Ireland. Third, it will be used in close consultation with Teagasc and SEAI to evaluate different scenarios of bioenergy production. This work will compare competing landuses such as the production of bioenergy feedstock with forestry and agriculture. The model will allow us to analyze the whole supply chain of bioenergy resources and spatially project the interactions taking place between producers and consumers. Furthermore, the tradeoffs between dedicated bioenergy crops (e.g short rotation forestry, intensive grassland) and close to natural ecosystems (forests, set-aside grasslands) will be built into the model such that we can not only optimize between different land uses, but also distinguish between different management practices.

The project is firmly rooted in a strong body of scientific work on land-use modelling, but is multidisciplinary in that it will address policy, land management and socio-economics of rural environments to cover all aspects of the sustainable production of bioenergy in Ireland.

There is one studentship associated with this project and it will be based at UCD

Project ECO 5

Improving the evidence base for policy decisions affecting the sustainability of transport-land-use relationships in the Dublin Regions

Principal Investigator: **Dr Brendan Williams** (UCD) – brendan.williams@ucd.ie
Collaborators: **Dr Aoife Ahern** (UCD)

In this project, we set out to examine how policy and infrastructure might be used to bring about more sustainable ways of travelling and living, with a PhD research project examining the different aspects of the impact of transport infrastructure provision on urban development patterns and form.

In this PhD it is proposed to examine how major transport projects (such as Metro North) might impact upon travel and commuting patterns, and also the longer term impacts of such projects on land use and development patterns. This is an integrated research approach as the student will be able to examine interactions between travel patterns and land use development in a corridor where a major piece of infrastructure, the Metro North, is planned.

The potential interactions between travel and commuting patterns and land use and development patterns will be closely explored. A feature of this project will be the use of advanced urban modelling techniques in the analysis. This will be assisted by the existing urban land use modelling capacity at the Urban Institute at UCD who have developed applications of the E U Joint Research Council initiated Moland model. This model has been developed and tested in applications in the Dublin region and resulting data and outputs will be available for this project. The objectives of this PhD will include:

- The use of MOLAND to investigate the impacts of land use planning policies on traffic growth, modal share and travel behaviour along the proposed Metro North corridor and likewise to use MOLAND to examine the impacts of new transport infrastructure on land use, modal share and traffic levels.
- The examination of the interactions between transport and land use at particular, important nodes.
- Making recommendations based on the findings for land use policies along transport corridors that will result in more sustainable travel and development.
- Assessing the cost implications of any recommendations.

There is one studentship associated with this project and it will be based at UCD