



Doing Transdisciplinary Research: Lessons from the Front Line

A Future Earth Ireland Workshop:
29 November 2016

This event was organised by Future Earth Ireland and supported by the Royal Irish Academy (RIA) and the Environmental Protection Agency (EPA). The objective of the event was to provide an update on the activities of Future Earth (FE) and to provide an opportunity for an exchange of views on the challenges and opportunities when one is embarking on transdisciplinary research.

Welcome and Introduction

Professor Eugene Kennedy, Secretary, RIA, welcomed participants to the FE discussion on transdisciplinary research. He thanked the RIA staff involved in organising the event, noted the active role the RIA had played to date in stimulating the growing national engagement in FE and expressed appreciation at the EPA sponsorship of the event.

Professor Anna Davies, Chair of Future Earth Ireland, thanked Professor Kennedy and noted that FE Ireland was established only this year. Transdisciplinary research, which provides a mechanism to link up people from different disciplines and to address challenges on a global scale, was a very important focus for FE. She advised that FE Ireland is a national research platform that feeds into international research. It has had a Twitter account, is on Facebook and has a page on the RIA website. Coordination of research is an important element of its work and it is reliant on ideas from people and networks from academia and beyond on how to structure its work programme. The aim is to marshal expertise, knowledge, and evidence to act across disciplines to deal with seemingly intractable challenges.

Update on Future Earth Europe

Mr Asher Minns, Head of Communications, Future Earth Europe

The European Regional Centre of Future Earth is based at the University of East Anglia in the UK and its role is to help the co-design and co-delivery of the Future Earth Vision in Europe. It helps regional research to be designed and delivered in ways that are useful for the user community of decision-makers, business, media and the public. It helps support European researchers to improve their science communication. It also helps shape European science and environmental policy and coordinate research towards sustainable development. Mr Minns cited the editorial by Johan Rockström in the journal *Science* which sets out Future Earth's role in international scientific collaboration. Professor Rockström concluded that editorial as follows:

Earth system resilience and stabilisation are necessarily rising to the top of political and scientific research agendas. With humanity at a critical juncture, Future Earth has the potential to become the largest, most ambitious international research program ever undertaken.¹

FE Europe aims to synthesise knowledge for policy makers consistent with the sustainable development goals and the agreed objectives of the Paris Agreement on efforts to combat climate change and adapt to its effects. In this context Mr Minns noted that the topline from the Global Carbon Project is that the amount of CO₂ we put into the atmosphere from burning fossil fuels, gas flaring and cement production has held steady for three years in a row, neither increasing nor decreasing significantly.

FE is an umbrella organisation which facilitates links and networking a little differently and gets disciplines to talk to each other and ultimately work together. FE Europe pursues public engagement. It connects, supports, and encourages researchers and helps establish national platforms like FE Ireland. It pursues alternative ways of working and networking for low carbon reasons. Within FE there are global hubs, regional offices, and national committees. Global Research Projects draw on the existing research base of high-quality science. The oldest such project has been going for 30 years. FE also has knowledge–action networks open for anyone to join – some of these are further ahead. While these may have traditional research themes, they are co-produced with stakeholders.

¹ <http://www.futureearth.org/news/future-earth-subject-new-science-editorial>

Steps in Co-design Process

Mr Tobias Buser, Network for Transdisciplinary Research

Mr Buser said that transdisciplinary knowledge production aims at societal problem solving. It produces knowledge not only *on* problems but also *for* transformations. Therefore, close interaction with societal actors that can take decisions, can act, or are affected in the respective field is key. To overcome the knowledge–action gap the approach includes stakeholders from the beginning (co-design), deliberates on normative target questions (what are more desirable futures?), and co-produces knowledge on how to reach these targets.

A transdisciplinary research process links societal problem solving with scientific knowledge production in a process of co-producing knowledge. The principles of transdisciplinarity are:

- Grasp the complexity of problems
- Take into account the diversity of life-world and scientific perceptions of problems, goals and solutions
- Link abstract and case-specific knowledge
- Develop knowledge and practices that promote what is perceived to be the common good.

Co-design and co-production between societal actors and different academic disciplines are the means of meeting these requirements in the research process in order to address the common good. Transdisciplinary research is appropriate when societal problems are being addressed, when the aim is to contribute to problem solving and societal transformation, especially for complex, contested problems. There are intensities of interaction: co-production, consultation, informing. Unlike other approaches where science only interacts with other actors when results are ready, transdisciplinary projects involve stakeholders from the beginning through:

- Goal and problem framing (co-design)
- Co-production of new knowledge (co-production)
- Bringing results to fruition (co-design/co-production).

However, these phases are often addressed in an iterative way, depending on the project's goal and starting conditions.

GOAL AND PROBLEM FRAMING PHASE (CO-DESIGN)

- Actor and context analysis to find relevant stakeholders
- Collaboratively define societal problems and goals to be addressed by the project
- Develop research questions according to these goals and scientific novelty
- Build a collaborative research team, include/enhance competences for interdisciplinary and transdisciplinary research processes
- Design a strategy for collaborative knowledge production

CO-PRODUCTION OF NEW KNOWLEDGE

Bringing scientists with different backgrounds and stakeholders together in a structured way to reach the project goals:

- Apply and adjust methods for knowledge co-production according to the project goals
- Develop bridging concepts/boundary objects that are tangible for all involved actors
- Carefully design, prepare and facilitate interactions
- Assign and support appropriate roles for practitioners and researchers, referring to the interests, needs, wishes (and fears) of the actors

BRINGING RESULTS TO FRUITION

- Integrate results to resolve or mitigate the problem addressed
- Integrate the results into the scientific body
- Produce targeted products for science, policy and practitioners – co-design respective products with exponents from the target group
- Long-term perspective for stakeholder interaction desirable – follow-up projects or organisation/platform to build long-term cooperation are an opportunity to intensify social learning processes and long-term impact

Mr Buser illustrated the approach above with the worked example of the WSL (Swiss Federal Institute for Forest, Snow and Landscape Research) research programme, *Room for People and Nature*. The object of this project was to initiate and foster sustainable urban and landscape development in peri-urban regions (i.e. urban–rural transition zones) and to develop landscape visions for the future. A small core group led the project. There was a two-year framing phase (2009–2011) which saw a move from vague ideas/research needs to a research plan. This phase included stakeholder consultation and identification of sponsors, a workshop to collaboratively define programme goals and main research questions, the selection of case studies and identification of sponsors and regional stakeholders. This was followed by building a research team including social and natural sciences. With the final research plan and signing of contracts, 2012 saw the initiation of the research.

MAIN STEPS IN THE CO-PRODUCTION OF NEW KNOWLEDGE PHASE:

- Co-production of landscape development visions with the regional stakeholders
- Elaboration of scenarios of possible future landscape developments and positioning the stakeholders visions in the set of scenarios
- Reflecting possible consequences and contradictions of the visions with the stakeholders
- Co-development of steering approaches with the regional stakeholders

BRINGING RESULTS TO FRUITION

Process outcomes:

- Contacts and dialogue between authorities, administration and Non Governmental Organisations (NGOs)
- Communes incorporated results into their spatial planning
- Group wants to meet again to discuss progress and challenges
- Co-production events were seen as the most important interaction steps by stakeholders and researchers, followed by excursions,

PRODUCTS

For stakeholders and other professional target groups:

- Co-designed brochure on the programme's main results and recommendations
- Brochure on conflict mediation in regional planning
- Recommendations on a controlling system for cantonal planning
- Articles in professional journals

For scientific audiences:

- Papers in scientific journals, each sub-project and programme level
- Conference on the results

The question was asked from the floor as to what to do if one or more stakeholders are opposed. Mr Buser's response was that co-production design with stakeholders helps diminish prospective problems and that a sound process design as well as mediation and facilitation also help.

He was also asked what happens when some stakeholders have fewer resources. He noted that the iterative process helps with a voice for non-funders. Transparency of funding and the evaluation of respective contributions also help but there is a power difference. A further question asked how to manage silence and fear where these are aspects of the dialogue. The response was that it is essential to get the full picture of the different actors' interests, needs and fears. Also it is important to work with a wide set of interaction methods and group settings.

Future Earth Coasts – Building on the Transdisciplinary Approach

Mr Jeremy Gault and Dr Martin Le Tissier, Future Earth Coasts International Project Office, University College Cork (UCC)

Future Earth Coasts (FEC) is a project to support sustainability and adaptation to global change in the coastal zone. The goal of FEC is to strengthen the science–policy interface and contribute to securing sustainable coastal futures in the new epoch called the Anthropocene. The aim is to develop a scientific and technological community from all disciplines for the co-design and co-production of knowledge that will engage with policymakers, business, industry, and other stakeholders. FEC is hosted by the Centre for Marine and Renewable Energy (MaREI), coordinated by the Environmental Research Institute at UCC.

MaREI is the marine and renewable energy research, development and innovation centre supported by Science Foundation Ireland (SFI). It is an amalgamation of three centres in the maritime and energy fields and combines the expertise of a wide range of research groups and industry partners with the shared mission of solving the main scientific, technical and socio-economic challenges across the marine and renewable energy sectors.

Mr Gault noted that mutual understanding is the key element of transdisciplinary research. Applied research is carried out in the MaREI Centre, the Beaufort Building, with the participation of multiple stakeholders. Funding is a mix of national and EU-derived. There are seven disciplines working together. He noted that mixing up people in the building will not of itself naturally create transdisciplinarity. The best technology solutions need to be in the ocean as, while Irish people want food and energy from the ocean, they want none of the associated infrastructure.

He cites as an exemplar of transdisciplinarity the work of the Coastal and Marine Systems Thematic Group. Coastal and marine environments and ecosystems are hugely important economically, socially and environmentally, and the Coastal and Marine Systems Thematic Group has significant experience in conducting research in, and synergising outputs from, these fields. The Group develops integrated solutions and conducts internationally and nationally funded research and consultancy in a broad range of projects and initiatives. This is achieved through the combination of fundamental and applied science across a number of key disciplines including governance, oceanography, ecology and geoscience. Outcomes and outputs are routinely used to advance scientific knowledge and improve understanding of system functioning, to inform and enhance management and sustainable development of marine and coastal resources with specific reference to public acceptance, and law and policy frameworks.

Dr Le Tissier complemented Mr Gault's presentation by focusing on the FEC community. FEC provides a platform for networking, delivering 'added value' to the outputs of the community to explore and understand the drivers and social–environmental impacts of global environmental change in coastal zones. FEC is a core project of Future Earth. Its work, in partnership with other Future Earth Core Projects, is structured to support the delivery of science-derived solutions that address global environmental and societal challenges, and are designed to broaden global change science to promote a transition to sustainability. The challenges of achieving sustainable development are complex and interrelated, centred on how to balance equity, justice, resilience, economic opportunity, infrastructure development, ecological management and more.

Challenges may be locally manifested but needing a worldwide response. For example, 94% of world trade takes place through ports, showing the intensity of use of the coastal zone. Key issues are how to make better use of existing resources and of the knowledge we have.

FEC is based in Cork, but has a global structure with global hubs. The aim of FEC is to develop a global platform for international scientific collaboration that:

- Strengthens global partnerships between researchers, funders and users of research
- Enables integrated research on grand challenges and transformations to sustainability
- Communicates science to society and society to science

Each week one million people migrate to coastal regions across the world. Needs identification is a critical stage. What is the situation of coastal areas now? What is their future? What do people want from coasts for the future? Science needs to be used for policy and practice in society. Coastal assessments should be framed in terms of sustainability, adaptability and transformation. We need to assess and synthesise knowledge from different disciplines. A transdisciplinary approach offers new ways to address challenges, potential pathways and catalysts towards solution-based outcomes and acceptability of proposed outcomes, derived from wide ownership and stewardship.

This presentation was followed by a number of questions, notably as to the sustainability of the MaREI centre. In response it was pointed out that the Centre earns its keep from SFI, industry and other sources. The projects undertaken and research publications also underpin the longevity of the Centre, i.e. 'producing papers to win the next project'. There was also a question about FE goals – some being more tangible than others – and the related issue of how to measure impacts. It was noted in response that the United Nations agencies want the FEC Office, which demonstrates its value. Global resources to address coastal issues are enormous, but there is a need to harness and leverage these. Operationally, the need for the FEC Office was to practise 'talking the talk', serving as gateway and clearing house to match consumers with producers.

Transdisciplinarity in practice

This session consisted of five presentations of five minutes apiece, together covering a range of practical experience in conducting transdisciplinary research.

Jim Clarken, CEO Oxfam Ireland, noted that the term ‘transdisciplinary research’ was not used often in NGOs, despite the experience of disciplines coming together to address seemingly intractable problems. He queried if problems should be regarded as intractable in any event, noting the tremendous strides being made on the eradication of poverty – the rate of global poverty has been halved over the past 20 years. He noted, however, that global inequality trends were going in the wrong direction. Wealth ownership is getting more extreme and 1% of the world’s population own half of its wealth.

He advised that Oxfam pursues a real interdisciplinary approach, working through civil society actors all over the world and with many disciplines converging, to identify areas of potential research on the basis of deep contextual analysis. The criterion for selecting a piece of research is that it can produce outcomes which can be scaled and employed.

Research is undertaken to facilitate change rather than for its own sake. The research is robust. The scale is not infinite – the focus is on areas where a number of disciplines can produce research to address specific problems which the relevant government can then bring to scale. Pursuing this approach, Oxfam works with partner NGOs, business schools and governments. Rwanda is an example: a project was developed which enabled the processing of pineapple suckers to add value in a context of limited land and space.

He noted that the experience of interdisciplinary research, bringing together natural and social sciences, is that it inculcates a culture of innovation. One such example is the popularity in Tanzania of *Female Food Heroes*, a project designed to showcase women food producers which has led to the creation of a popular reality show on TV which is helping to transform attitudes.

Mr Clarken also pointed out that issues need to be addressed about the use of humans as placebos in research. Oxfam is also pursuing a strategy of how to change the trajectory of development, e.g. through work in progress on the impact of taxation on developing countries.

Dr Lynn Dicks, Applied Ecologist, University of East Anglia, noted that operationally she had found the following challenges in working in a transdisciplinary way.

With regard to policy and producing policy proposals which would secure traction, the biggest challenge is the different perspectives on timescales. People interested in availing of policy research outcomes often have an ‘answers now’ ethos which is difficult to reconcile with stakeholder engagement in its various manifestations. NGOs often want the researcher to

advocate rather than stick to the findings of their research project. Nonetheless there is a duty for scientists to communicate their findings to inform public policy making.

Dr Dicks cited as an example of this the article *Ten Policies for Pollinators*². In the context of the evidence for large-scale decline in wild pollinators in North West Europe and North America, this article suggests ten policies which governments should seriously consider to protect pollinators and pollination services. It was also appropriate to engage in informed debate in such forums as the forthcoming COP 13 (thirteenth meeting of the conference of parties to the Convention on Biological Diversity, 4–17 December, Cancún).

Ms Johanna Ickert, University of Plymouth, is a documentary filmmaker and cultural anthropologist with a major interest in the transdisciplinary potential of approaches in science communication in the field of georisks, environmental change and sustainability. Her PhD research will explore the potential of visual anthropological methods in the field of seismic risk communication, focusing on the example of earthquake risk communication and mitigation in Istanbul.

With regard to seismic risk in Istanbul (there is a 65% probability that Istanbul will be hit by a 7.6 scale earthquake by 2030), she notes that risk mitigation measures are extremely politicised, with laws providing for the retrofitting of whole areas of the city causing considerable disruption to locals. The public attitude to earthquake risk is coloured by these tensions. Citizen dialogue is relatively unfamiliar. There is also a lack of forums for science communication. She has conducted a series of narrative interviews which point to the need for recognition in dialogue of important community-centred topics which might shift the focus from the risk to what to do about the risk.

Dr David Prendergast, Intel Ireland, is a social anthropologist and a Principal Investigator in the Intel Collaborative Research Institute for Sustainable Connected Cities with Imperial College and University College London. He was instrumental in establishing, and continues to drive, the Dublin Living Labs collaboration between industry and academia and local government – this is an umbrella programme for a series of collaborations that will see the development and testing of citizen-centric services and solutions that further the drive towards delivering sustainable connected cities. He has a particular interest in culturally appropriate technologies.

The Dublin Living Lab (DLL) academic–industrial collaborations have inbuilt transdisciplinarity. The objective is to look not only at scaling up projects but also at how to evaluate them. DLL works with Dublin City Council on significant challenges. Flooding, alluvial flooding in particular, was selected as a priority area for such research, and work is in train on how to acquire and analyse data.

² <http://science.sciencemag.org/content/354/6315/975>

Another DLL project is the *Croke Park Smart Stadium*. This sees Croke Park used as a test bed for some of the most cutting-edge Internet of Things (IoT) technologies. Croke Park is wired up with multiple connected devices including sensors and cameras that collect data from special events. The analysis of this data helps Croke Park build new services, and better customer experiences. Croke Park has partnered with Intel, DCU, Sun Devil Stadium and Arizona State University to deploy pilot IoT technologies, mostly involving fan experience and crowd behaviour. It is a small enough space to trial smart city solutions but big enough to get results that can be used to solve problems.

These projects employ the collaborative working out of solutions through the collection and analysis of data and engagement with many specialist areas and different levels within the City Council and Croke Park respectively.

Dr Frank McGovern, Head of Climate Change, EPA, noted that there was much to be learned from FE. The EPA had been doing transdisciplinary research for quite some time, and research on environmental issues was intrinsically transdisciplinary. Such research was essential as a tool for alignment with other bodies. The nature of the challenge determines what research is needed. Co-design and co-production could help resolve conflicts and contradictions – some disciplines see ownership as important.

He further noted that while engineering is, of course, important, there is also a need to come up with human solutions; to bring pathways into homes and communities dependent on the source of a problem. There is a need for new, radical thinking and decisions.

On the issue of advocacy versus communication on the part of the researcher, he believed it was essential for the researcher to give enough direction to enable decisions to be made. The Paris Agreement on efforts to combat climate change and adapt to its effects shows the value of internationalism. It is necessary to address problems adequately, in a timely manner and on a well-founded scientific basis.

He concluded by opining that it might be useful to have a discussion on the framing of issues on some other occasion.

Closing Discussion

In the ensuing exchange of views, the following points emerged.

- It is necessary to embed a transdisciplinary approach in academic institutions. The institutional culture is still predicated on publications rather than other outputs.
- Researchers often do not do transdisciplinary research as they lack incentives to do so. However, this is changing in the UK – ‘If you can present yourself as someone who has achieved impact you can get a job.’
- Funders of research are also starting to ask questions; a lot of projects now seem to require input of social scientists as well as natural scientists.
- You may be part of an interdisciplinary group, but transdisciplinarity is really difficult to practise if research goals are not clearly articulated.
- It is essential to communicate beyond academia. You have to learn other people’s messaging. You communicate at different levels. You want your research findings to speak to the people who are the decision makers and influencers and to the people who are affected.
- You can learn how to communicate if you spend time with the interlocutor. Communicators must be part of the research team.
- Time constraints are an issue with regard to influencing the policy space – is the topic on the agenda?
- All funders have begun to bring in criteria re who research is geared to – but there is a gap between the supply of researchers and the wider remit.
- Should there be training in transdisciplinary research? Should there be training for undergraduates in transdisciplinary research? What should the top three skills in transdisciplinary research be? We will need to change the way we teach.
- If there is a culture of communication, of engaging the public, of co-designing a project, who sits at the table to do co-design?
- In development, the identification of a problem has to be done by the people it affects and it is necessary to work outwards from that.
- Ten years ago it was really hard to find interaction between disciplines in Ireland but now there is a sharing of space and ideas. Transdisciplinary research brings insights and ideas to people. But we do need to work on the skills involved.
- Re the politics of inclusion, we should always go for plurality rather than concentrate solely on the affected community – there should be an equal voice.

- There are capacity limits to co-design. For example, from the EPA perspective there is wide consultation and an effort to be as inclusive as possible. But when it comes to decision-making there is a small number of people with power and means. That is the political system we work in.
- There is also a challenge in getting people to participate.
- Has recognition of transdisciplinarity research fed into hiring decisions in the UK? When impact affects funding decisions it affects universities. Transdisciplinarity leads to excellent research. Everything is shifting in the UK. Very applied research is doing very well.

Professor Davies thanked the five contributors to the *Transdisciplinarity in Practice* session for sharing their experience and expertise. She noted that this was the beginning of a conversation and welcomed the contribution of ideas to enhance this debate within FE Ireland.

