



# THE NEXUS NETWORK

new connections in food, energy, water and the environment

An ESRC investment

## **Transdisciplinary Methods for Developing Nexus Capabilities**

**Report of a workshop held at the University of Sussex**

**June 29 and 30, 2015**



## About the Nexus Network

Funded by the ESRC, the Nexus Network ([www.thenexusnetwork.org](http://www.thenexusnetwork.org)) is a collaboration between the University of Sussex, the STEPs Centre, the University of East Anglia, and the Cambridge Institute for Sustainability Leadership. The Nexus Network brings together researchers, policy makers, business leaders and civil society to develop collaborative projects and improve decision making on food, energy, water and the environment.

## About the workshop

On June 29<sup>th</sup> /30<sup>th</sup> 2015, the Nexus Network, led by Professor Andy Stirling, held a workshop on transdisciplinary methods for developing Nexus Capabilities, at the University of Sussex. The full agenda of the workshop can be viewed here:

<http://www.thenexusnetwork.org/events/transdisciplinary-methods-for-developing-nexus-capabilities-workshop/>

In light of growing challenges in the just, equitable and sustainable global provision of water, food and energy and the complexity of the interactions between these vital systems (the challenges of 'the Nexus'), participants in the workshop were encouraged to consider the following key questions:

- *What different kinds and interconnections of method in contrasting contexts, form the most practical basis for enabling transformative action to address Nexus challenges?*
- *How can such encompassing Nexus methodologies best enable academic, government, business and civil society actors to develop appropriate skills, training and research capabilities?*

These questions are also addressed in a discussion paper prepared in advance of the workshop by Professor Andy Stirling, which can be downloaded from the Nexus Network website:

<http://www.thenexusnetwork.org/wp-content/uploads/2015/06/Stirling-2015-Nexus-Methods-Discussion-Paper.pdf>

This workshop was one in a series of thematic workshops being organized by the Nexus Network from 2014 – 2017, intended to stimulate discussion and build capacity among the community of researchers and other stakeholders working on nexus-related topics.

## About this report

The Nexus Network commissioned the present report by an independent science writer **Martin Ince** ([www.martinince.eu](http://www.martinince.eu)), as a record of the concerns and issues discussed at the workshop, and to highlight some approaches to them that might be of value to participants in the network and with related interests. This report is not the 'minutes of the meeting', but is intended to capture the diversity of discussions that took place at the workshop. The report does not quote individuals except plenary speakers, an approach which allowed everyone present to speak frankly. Martin wishes to thank the five note-takers who tracked the workshop breakout sessions.

Note: this report does not necessarily reflect the views of the Nexus Network or of individual workshop participants.



## Introduction

The Nexus Network aims to facilitate investigation of the critical linked issues of energy, water and food supply in the context of climate change, and in a people-centred way that generates insights which are of value beyond the academic sphere. Success in this ambitious aim will involve far-reaching research in, and between, a vast range of academic subjects, as well as deep connection between the research and the communities it concerns. This will mean using currently accepted academic techniques alongside novel methods and approaches that may not exist yet. It will involve developing new capabilities, and learning from innovative approaches that have succeeded elsewhere. On June 29 and 30, 2015 the Nexus Network ran a workshop on the transdisciplinary methods needed to fulfil its scholarly and public ambitions. Held at the University of Sussex and attended by 67 participants, it produced a wealth of insights into the opportunities of Nexus-focused action and the capabilities needed to fulfil them.

## The debate

Many of the issues raised at the workshop also arise in the context of multi-, inter- and trans-disciplinary research more widely. One of the most important is the widespread impression, itself the subject of debate at the workshop, that despite their high social value, these forms of research have less academic prestige than single-discipline work, may result in lower-impact publications, and can be damaging to academic careers. In addition, research based on a range of disciplinary styles can produce complex findings which are hard to turn into policy advice or stakeholder recommendations. However, we also know that transdisciplinary approaches to knowledge are already in use in government, in business and elsewhere. For example, Guy Poppy, Chief Scientific Advisor to the Food Standards Agency told the Workshop that FSA social scientists “walk the food chain” to help it carry out its duty to protect consumers, assist them in making informed choices, and give them the best possible food future. These are complex aims in a world where UK consumers eat food from 186 countries. One example of a Nexus-type approach to food safety is the analysis of Twitter trends to pinpoint food poisoning episodes long before laboratory analysis can do so. Another is the way in which experts on soil, seeds, water, crops and wildlife already work together on land management issues across the UK. Some of the individuals involved, such as seed company representatives, have a high level of trust despite their interest in business and sales.

Many workshop participants felt that Nexus initiatives should be instrumental, because they needed to address severe problems, but at the same time critical. Without this critical component, their approach might be perceived to lose its scholarly and academic value. For example, the apparently simple

question “Is nuclear power safe?” can have many answers, depending on whether the question is posed to emphasise the interests of government, business, local residents, or other stakeholders, as well as its framing in terms of variables such as the timescale being considered. So a critical and multidisciplinary approach to this issue is essential. Ideally, the claims of different interest groups should be seen alongside each other in order to help make less well-resourced interest groups more visible. This wide-ranging approach to issues needs to be tolerant of ambiguity and should allow for methodological give and take.

Gary Kass, Deputy Chief Scientist at Natural England, a speaker at the workshop, was clear that these issues are ones that today’s university system is ill-equipped to cope with. He said that its incentive system is not designed to produce the skills needed for the creation of “relevant, credible and legitimate” knowledge. By contrast, Natural England already uses a wide range of expertise in an integrated manner. These include its traditional disciplines such as ecology alongside risk assessment, futures analysis, and “underpinning” skills such as knowledge-sharing and ways of acting in complex settings. Another speaker, Jim Watson, Research Director of the UK Energy Research Centre, told us, perhaps to some surprise, that the Ministry of Defence is a user of Nexus-related practice in its work on resource conflicts. He added that at present, there is little sign that the insights generated by this process are articulated in policy.

One possible criticism of the Nexus and the way it frames issues is that it does not rule anything out, and can end up appearing little more than an assertion that everything is linked to everything else. The solution, according to one speaker, is to ensure that people and their interests are a central component of any Nexus-related project, and that their relationships and interests are a key part of the empirical analysis that the project undertakes. Many Nexus-related issues are about human behaviour, a fact which underscores the importance of anthropology, psychology and related disciplines to any Nexus approach.

It is also important to think creatively about the way in which researchers interact with existing power structures. This is, of course, an issue which arises in many contexts far beyond the topic of the Nexus. One speaker said that the massive problems which Nexus-research aimed to address require change on a scale comparable to the establishment of the Welfare State in 20<sup>th</sup> century Britain, with the implication that it inherently supports new institutions and ways of working. However, Christian Stein of the Stockholm Environment Institute stressed that it was essential to work through existing governance systems.

## Boundary-spanning mission

One way of squaring this circle is to encourage the emergence of a new cohort of boundary-spanning people and organisations. Their role would be to understand the language and priorities of (say) community groups, businesses and government, and allow them to exchange knowledge and views in a way that did not privilege existing dominant interests. The Nexus Network itself is already emerging as a “boundary organisation” of this type. Many professional bodies also take on this role. NGOs are a further group of organisations which can be valuable mediators between academia and society. They vary from multinational to local in scale, and smaller ones may have little capacity for knowledge dissemination.

Workshop speaker Sue Hartley gave us an example of an existing Nexus-type organisation within the academic sector, the York Environmental Sustainability Institute. YESI has shunned having a building on campus, instead operating as a broker organisation to 120 academics from 20 York departments, and has been funded as a resource that anyone at York can use. Its recent work has included a project in India at the junction of food, water and climate change, carried out with Indian and US colleagues. As the monsoon becomes less reliable due to climate change, new types of rice are needed to maintain yields. The search for new cultivars, however, did not begin with botany but with social science. The first requirement for new types of rice expressed by the women who would harvest it was that it should not take any longer to pick than existing varieties do. Hartley commented: “Genomics means we can generate anything we want in the lab, but we have to be sure that we are producing what’s needed.” Because this project interacts with a farming cooperative which has 40,000 members, it is capable of having rapid and sweeping results. This is one example of a wider point: it may often be possible to get bigger and quicker change by working with the business sector than with government and the policy machine. A further case in point is the speed with which industry is now starting to invest in renewable energy. Perhaps the first significant organisations to take climate change seriously were insurance companies. They invest over many decades and need to anticipate risks such as the danger to agriculture of altered water flows, or the increased risk of storms in a warmer world.

Companies can be significant allies for Nexus-type research for two other reasons. They hold massive amounts of data to which it may be possible to gain access. For example, PepsiCo has climate and other data from tens of thousands of farms around the world. In addition, policy advice to government is often altered at the last moment in line with events, but businesses tend to value longer-term stability in their thinking. Many are redefining their ideas of competitive advantage in line with climate change, and have a growing awareness of Nexus issues. However, the business sector is also highly diverse. A deep involvement with it would call for a full range of engagement approaches, and engagement with

business can be contentious. For example, the point was made at the workshop that not all companies are equal, and not all are equally comfortable partners for the researchers. Raimund Bleischwitz of University College, London, highlighted the example of the mining in Africa of the mineral Coltan, an input for today's mobile communications devices. It is often mined on a small scale by artisanal miners who abandon their work as farmers when Coltan prices rise. When they do this, farm production falls and the hunting and consumption of bushmeat rise. Government incomes also go down, as this form of mining tends to operate outside the tax system. Instead it enriches organised crime and smuggling. These minerals end up being made into finished devices by corporations which are, more or less knowingly, encouraging these crimes and damaging emerging nations. Some businesses are more interested than others in avoiding these bad practices, and potential academic collaborators need an awareness of these issues.



There was also some disagreement at the workshop about the importance of policy-relevant research. One participant questioned the value of policy work as a priority, when energy could be put into “making a difference on the ground.” However, the UK research councils are themselves government bodies with an enthusiasm for engagement with the policy machine, which means that policy research will continue to have high signal value for funders. Policy was also recognised as one of the most

acceptable forms of REF impact. Policy intervention is complicated by the fact that government is a competitive process in which ministries and individuals compete, and in which different considerations (economics and the environment, say) vary over time in their perceived importance.

The idea that human beings are the most effective form of knowledge transfer, whether into or out of universities, was also discussed. It was suggested that there was a need for more placements and exchanges involving universities, policy-making bodies, business, NGOs, community organisations and other groups with engagement capacity. A range of such schemes was mentioned including several which put junior researchers into Parliament with MPs or at POST, the Parliamentary Office of Science and Technology.

## Importance of time

A further common theme of the workshop was time. Multidisciplinary groups need time to establish trust and common language, and multidisciplinary research is inherently complex. A PhD timescale of three years may not be enough. Even academics working across disciplines tend to have a 'home discipline' in which they need to be excellent. This means intense demands on their time. In addition, many Nexus issues involve long timescales and may call for familiarity with methods such as Horizon Scanning, usually associated with the futures community rather than with academic projects. One such method, scenario planning, is widely used in energy and carbon policy and in considering environmental issues such as biodiversity, and could be more widely applied. These approaches allow quantitative and qualitative methods to be used together and to question each other's assumptions and approaches.

All this suggests that Nexus-related research projects need to be long-term and to have capacity for futures thinking on a scale of decades. But at the other extreme, they need to be able to generate outputs intended for non-academic audiences, and these are needed on a much briefer timescale. This is a frequent academic concern but arises especially often with regard to Nexus issues.

Professor Andy Stirling's parallel paper to this report (<http://www.thenexusnetwork.org/wp-content/uploads/2015/06/Stirling-2015-Nexus-Methods-Discussion-Paper.pdf>) lists over 100 examples of Nexus-related approaches to a range of problems and projects. Choosing an appropriate methodology or methodologies from the plethora of possibilities is itself a challenge, especially given the broad range of data, disciplines and interests that a typical Nexus project must address. No individual researcher is likely to be familiar with all the options. These methodological choices might seem to be a point of detail, but they often reflect the preferences of existing powerful groups.

This leads on to a specific concern with mixed methods, expressed by several workshop participants.

Mixed method approaches ought in principle to be flexible and scalable, and therefore ideally suited to research into transdisciplinary/ Nexus-type issues. In practice, research funding panels can be monodisciplinary and unsupportive of mixed approaches. Once a project is active, there can often be difficulties in developing a problem-oriented approach rather than one that relies upon previously-used methods leading to publication in familiar journals. This points to the need for new forms of research publishing that allow complex findings to be communicated as a whole rather than being chopped up for specific discipline journals. Janet Cotter of Greenpeace asked whether transdisciplinarity could itself become an academic silo. This is may well be a valid concern, although many workshop participants appeared to think that it has yet to become a serious problem. It was also stressed in a breakout session that methods affect the user as well as the subject. Participants asked what the choice of a method does to the researcher herself and whether methods can be devised that engage people's emotions and their desire to act, as well as yielding new and systematic knowledge.

## **Scale as a key variable**

As well as time, scale emerged as a frequent concern. Researchers working on Nexus-related topics are concerned with urgent global issues that require action. But this raises a key difficulty. The people-centred Nexus focus is likely to yield a subtly different answer to similar questions in different settings or at different scales of analysis. The kinds of cultural difference to which Nexus-related research is attuned inherently makes it tricky to produce "best practice" which can be applied universally to solve a specific problem.

Professor Tim Benton of the University of Leeds added a further complicating factor. He told the workshop that the natural sciences still don't know definitively what "sustainability" is. Does it mean sustaining food output, or sustaining ecosystems, or their services or sustaining "the world as we know it?" His own view is to look at systems on a landscape scale, in terms of food production and the services they provide such as carbon storage, biodiversity and its associated services to pollination, pest control and cultural identity, the communities they support, and the cultural artefacts they contain, such as heritage architecture. These systems contain many dependencies, for example the effect of changed agricultural practices on water quality, availability, biodiversity, leisure fishing and flooding. There are also scale dependencies at work. If an individual farmer removes some unusual species habitat, nothing much happens. If every farmer in the landscape does so, there will be severe effects on that species and perhaps others.

An example of scale effect from Benton's own area concerns organic farming. Whilst on an organic farm, you typically find more biodiversity than a standard farm, at a landscape level it is possible to get both more food and more biodiversity with a mix of conventional farming methods and setting land aside for nature reserves than from a landscape entirely made of organic farms. This is because an organic field produces less food than a conventional field and less biodiversity than land specialised to support it, so a mixture of the land uses specialising on food or biodiversity may do better. In addition, increasing organic food production, without reducing demand in the UK would lead to more imports, and perhaps drive intensification in areas with greater ecological value. Thinking about this issue at farm, landscape, national or global levels could lead to very different solutions and recommendations.



Panel speaker Professor Henrietta Moore from UCL, reminded us, too, that issues of gender and ethnicity that are already present in scholarly and public discourse arise with fresh force in Nexus-related debates. In the water arena, the workshop heard of a case in Mali where a new well in a village centre had given women an extra three hours a day by reducing their journey for water, improving their lives far more than any other development initiative. One participant pointed out that more should be made of positive stories such as this, given the generally problematic nature of Nexus issues. One parallel is the Lancet's recent work on the health effects of climate changes, which has stressed opportunities as well as challenges. Making the most of these possibilities will involve new approaches to interdisciplinarity which increase its status and reduce its practical difficulties. Funders can help this process financially and by support for the time-consuming task of external communications and engagement. (ESRC is acknowledged to have done both.) However, it is not always apparent to critics

that a multidisciplinary approach is the right one for every problem. Supporters of these methods will have to show that there are problems for which the range of transdisciplinary techniques is the right one. Institutions can help to support people working in this way, for example by systematic training in interdisciplinary methods. “Agile” research in which participants are mixed and matched from a range of backgrounds is accepted practice in engineering and might inform thinking in other sectors.

A specific concern of the workshop was with complexity and uncertainty, and especially with the communications issues that these factors bring with them. Research on Nexus challenges may require a holistic approach to issues, and therefore runs the risk of creating a message that is too complex to be explained or to have impact. This also calls for capacity-building among companies, public bodies and other organisations, and among the “public,” about hearing and dealing with complex information. The overall impression given by this lively workshop is that interactions at the Nexus call for new approaches to methods and data, and to academic disciplines and structures. A key issue will be personal development. For example, there were various calls during the workshop for better mentoring for researchers working on transdisciplinary Nexus issues, especially those at PhD and postdoctoral level. But despite these difficulties, it is also apparent that the Nexus approach is a valuable one with widespread application, and that it is already in use in interesting ways within and beyond academe. Finally, these examples point to the need for new forms of academic leadership. The problems with which researchers affiliated with the Nexus Network are engaged, call for distributed leadership and management rather than approaches dominated by individuals. Research leaders will be forced to realise that their knowledge is only part of the picture in any Nexus issue and that their team cannot succeed without external inputs.

This may seem like a daunting agenda. But on July 5, a few days after the workshop, the Observer newspaper published a feature on the deaths of Marc Cornelissen and Philip de Roo, two scientists and activists working in the Arctic, that may help us put the importance of a Nexus approach in context. In the final paragraph, author Ruth Dawkins says: “I learned from them that science and campaigning – feed in and reach out – are two sides of the same coin. Progress is often slow. One man digging a hole in the ice may not feel like he is achieving much. One man standing in front of a lecture theatre may not feel like he is changing anything. But when you learn to see that personal effort in the context of collective action, it feels a lot more powerful.”

The workshop was not designed to produce a settled series of recommendations, however, **Boxes 1 and 2** present a diverse group of selected concerns and priorities which emerged as possible topics for future discussion.

## **Box 1. Summary of selected concerns around transdisciplinary research**

Transdisciplinary research is complex and time-consuming, especially when it is done in a way that incorporates non-academic engagement. Funding systems need to change to face this reality.

There are many barriers to success in this endeavour, including the dominance of single disciplines in academic promotion, in publication patterns and in prestige. These barriers need to be eroded, but without damaging individual academic disciplines. Hopes were expressed that the next REF will value impact, and especially transdisciplinary impact, more highly than the first version did. It was suggested that the notion of academic “quality” should be redrawn to add relevance to scholarly content, since the issues which concern Nexus are too urgent for research which lacks relevance.

The Nexus Network is intended to engage with a wide range of non-academic entities such as government, business, NGOs, publics and others. Finding out about their priorities and learning their languages is another time-consuming and difficult task. For example, there are some pre-competitive issues on which companies are willing to work together despite their commercial rivalry. Placements that swap people between universities, business, policy organisations, NGOs and other Nexus stakeholders are especially important and should be developed further. This kind of knowledge is necessary to allow the network’s claims and outputs to be customised for their intended audience.

Although the Nexus Network embodies a radical approach which inherently points towards new paradigms as well as new policies, the degree to which researchers should aim to work with, or to act to counter, existing power structures is contentious within the community of researchers working on nexus-related topics. But workshop participants agreed that it is important to develop Nexus interventions in wider debates if its findings are to help unblock policy. The aim should be to create rapid change such as the current significant switch towards investment in renewable energy.

The transdisciplinary approach can create findings that are complex and hard to apply. Skills development among audiences as well as researchers will be needed to clarify the claims that Nexus-related research produces, even when they have been produced by close engagement with a range of participants.

Co-construction of research is at its most valid when the ideas come from the outside at an early stage, not when the outside world is consulted as the research gets going. Nexus-related research should be participatory, whenever appropriate participants exist and wherever participation will benefit both sides. This too will take time and cost money.

External stakeholders also need the capacity to interact successfully with Network projects and findings. These findings will need to be implemented at various scales, from the individual householder or farmer to the level of globalised trade. This means building the ability to engage with a full range of audiences, and to communicate complexity and uncertainty on a range of spatial and temporal scales.

The challenges presented by Nexus interactions also present an opportunity to develop transdisciplinarity beyond its present limits. While natural and social scientists have worked together for decades, they often still fail to communicate with each other effectively. Risk and uncertainty as natural scientists understand these terms can arise from the limits of the scientific method, while social scientists might see them in terms of the complexity of human society. More emphasis is needed on reducing these misunderstandings, for example by methods such as decision analysis and by insights from psychology and anthropology.

Finally, it was widely recognised that these concerns are not unique to the challenges posed by the Nexus. There is good practice and experience from which researchers involved in Nexus-related research can learn, and existing resources to be made use of.

## **Box 2. Outline of possible approaches discussed**

Many at the workshop felt that more capacity needs to be built for transdisciplinary research. This means broadening undergraduate education and the PhD experience, and enabling more established researchers to work across and beyond disciplines and to develop boundary-crossing skills.

Learning to do transdisciplinary research may be inherently uncomfortable for researchers who have come through a single-discipline background. Support mechanisms for those who take this step could be improved in the hope of broadening the attractions of transdisciplinary research. This is partly a matter of funding, partly of personal support, and partly of building more satisfactory career routes for transdisciplinary research.

Mentoring of individuals and teams by a well-chosen mentor may be particularly helpful, especially for early-stage transdisciplinary researchers.

Transdisciplinary research is about often more about teams than individuals. It might be preferable to recognise this reality by focusing attention and funding more on teams than on individuals.

Nexus-focused research is likely to produce ambiguous answers to important questions. How can we persuade audiences to accept provisional findings that require judgement and interpretation? Again, success here may call for close and extended involvement in non-academic communities by trained communicators. Foresight methods are likely to be valuable within Nexus-related research, and for communication and engagement of Nexus findings.

A wide range of methods may be applied to the problems which Nexus seeks to address. They are both qualitative and quantitative, and are drawn from the full range of academic disciplines. Researchers will need training in choosing the right method as well as in using it. Mixed methods are likely to be appropriate for many Nexus-related problems.

“Agile” research in which people with different skills come in and out of a specific project is an established method in engineering research. Work should be done on extending its use.

The Nexus Network is a mainly UK activity, despite the global nature of the challenges it addresses. Nexus ways of working appropriate to the global South need to be developed.