Tyndall Centre
for Climate Change Research

Achieving the UN Paris Agreement

Our Research Strategy 2018 onwards
Tyndall Centre for Climate Change Research

Draft for consultation

Table of Contents

Our ambition for the next 5 years...

The UN Paris Agreement is the greatest ever achievement of science for global policy research. We at the Tyndall Centre with professionals worldwide played a role. The Paris Agreement now provides new aspiration for the Tyndall Centre and how we engage.

We are also part of an even bigger global ambition, Paris' climate action coupled with the UN Sustainable Development Goals. These are principles to live our lives by, a planet-wide opportunity to critically re-think how we live within the environment that supports us.

So, we have this year revisited everything that what we do across all our disciplines and universities at UEA, Manchester, Cardiff, Newcastle and Sussex. Where can we together make the biggest, fastest difference?

1. **Accelerating Social Transitions**
   We research people at the heart of the transformation required by rethinking and reshaping the ways in which energy and resources are used to provide all our everyday services.

2. **Overcoming Poverty with Climate Actions**
   We turn climate research upside-down to understand how climate policy can support poverty alleviation. No Poverty is front and first of the seventeen Sustainable Development Goals.

3. **Building Up Resilience**
   We identify synergies between urban and ecosystem resilience to support people and biodiversity. Our focus is delivering integrated policy priorities for cities and nature.

4. **Reaching Zero Emissions**
   We develop new mitigation pathways needed while tackling the taboo of the hard-to-reduce CO_2 sectors such as trade, transport and food.

We support a new generation of dynamic skilled researchers to be 21st Century leaders of interdisciplinary science for sustainability.

We communicate our science and engage across all stakeholders. We advocate for climate mitigation, adaptation, and overcoming poverty and we rigorously debate choices and consequences.

We develop low-carbon practices. Our own research demonstrates the urgency with which society needs to be zero-carbon. We know that researchers who 'walk-the-talk are the most trusted.

Our next five years of the Tyndall Centre will see our research and efforts focus on supporting key decisions and transformations in society. By 2022 we will know if the Goalposts of the Paris Agreement and Sustainable Development Goals are in sight.

Accelerating Social Transitions

Led by Prof Lorraine Whitmarsh, Cardiff University
Dr Charlie Wilson, University of East Anglia
Dr Clare Hoolohan, University of Manchester

In the global north we are constantly mobile and constantly purchase goods.

Lorraine Whitmarsh

As households, we heat our homes and cook and make choices about what to buy.

In our communities we exchange ideas and signal our self-identities to ourselves and others with our consumer choices.

Charlie Wilson

'Transition' describes a system-wide process unfolding through entwined social and technological change at multiple scales. By focusing on 'social transitions', we analyse our ways of life and our relationships with technologies and infrastructures.

Claire Hoolohan

Collectively, our research contributes to accelerating social transitions towards a zero-carbon future. We will deliver our improved understanding back to policy-makers to support evidence-based decision-making. We engage with non-governmental organisations and industry to improve the design of low-carbon innovations and interventions.

We advance knowledge in five key areas. From historical analogues to future visions:

- How can compelling visions of a low-carbon future motivate change?
- How are different social groups affected by change?
- How can historical analogues help inform current efforts to drive change?

Weimplement large-scale surveys to examine public perceptions of new low-carbon technologies and their future prospects; we use historical case studies to understand drivers and barriers to rapid social change; we develop participatory scenarios and systems modelling to explore plausible storylines of low-carbon transitions and how these will affect people's daily lives.

We emphasise the socio-technical and systemic nature of the problem and the solutions:

- How can interactions between people and technology and materials resist or enable change?
- How can cultural variability help change?
- How can the media enable or undermine change?

"People are at the heart of the change required."

We apply in situ ethnographic methods to understand how people and technology interact in specific settings, and with what implications for emissions; we analyse textual data from media and other actors who influence opinion, action, and discourse; and we use cutting-edge modelling techniques to capture heterogeneity in how households and firms adopt and respond to low-carbon technologies.

We focus on how systems are governed, from formal policy instruments to informal institutions:

- How can governance institutions and policy approaches effectively drive change?
- How can high-emitting behaviours be effectively targeted for change?

We work with local, national and international decision-makers to understand the institutional contexts in which policies are made and plans put into action.

We highlight the potential importance of people as consumers, energy users and shapers of shared values and culture:

- How can consumer demand for low carbon innovations contribute to change?
- How can people's expectations for quality of life enable or undermine change?
- How can society reconceptualise its shared goals to support change?

We analyse how expectations of change transform into experiences of change, and the implications this has for public acceptability.

- How can researchers effectively work with and engage stakeholders for change?
- How can empowered communities and grassroots initiatives contribute to change?
- How can researchers work effectively across disciplines in support of change?

We develop and test participatory and engagement processes that elicit public and stakeholder views on social transitions and feed these into local, national and international decision-making.

We will also engage with the broader academic community to integrate our insights into climate science and policy. This includes improving integrated assessment models and IPCC assessments to provide more socially and behaviourally realistic simulations and projections. We also apply and promote innovative low-carbon research practices to demonstrate new ways of working.

Overcoming Poverty with Climate Actions

Led by Dr Sarah Mander, University of Manchester
Dr Mark Tebboth, University of East Anglia
Dr Lucy Baker, University of Sussex

That the impacts of climate change will unduly affect the poorest and most vulnerable people in the world is well established. Climate change is embedded within the same complex and interconnected socio-economic, political, technological, industrial and environmental systems as poverty and inequality.


Sarah Mander

In an unequal world, what does the imperative to mitigate and adapt to climate change mean and for whom?

- How can actions on climate change be orientated to minimise harm to poor people?
- What is the role of powerful institutions and governments?
- Is success enhanced if it also yields co-benefits for poverty and inequality?


Mark Tebboth

We build understanding about how actions on climate change interrelate and interact with the multiple dimensions of poverty and inequality within and between nations, including definitions, concepts and measurements of absolute and relative poverty, poverty of access and opportunity, and socio-economic well-being.


Lucy Baker

We also seek to explore areas and sectors where the synergies are not so readily identifiable. This includes the more difficult decisions on trade-offs between climate change mitigation and adaption and different dimensions of poverty and inequality.

We recognise and interrogate different scales and explore why some visions have traction and others do not.

- How can actions to address the causes and impacts of climate change incorporate the multiple dimensions of poverty and inequality, and vice versa?
- In what ways and under which circumstances do climate change, poverty and inequality interact?
- What are the structural and systemic barriers and enablers that facilitate or undermine effective work and comprehensive understanding of poverty and climate change actions, and how can these be overcome?

In all our choice of methods, co-production is the central element of our work to ensure it meets the needs of different communities and perspectives, with particular attention to vulnerable and marginalised who are often excluded from decisions.

"Climate change interrelates and interacts with poverty and inequality"

We employ a variety of theoretical approaches and methodologies building out from our core expertise in the social and natural sciences and drawing in other disciplines. Systematic theoretical approaches will be developed to map climate actions to the Sustainable Development Goals to understand key synergies and trade-offs.

We use political economy approaches, including in the energy, forestry and agricultural sectors, to understand how decisions are made and influenced to create knowledge on the political barriers to the success of technical climate actions.

Empirically our work draws extensively on our existing case studies and use a variety of methods including scenario development and visioning, discourse and social network analysis, as well as quantitative methods:

- What are the trade-offs between addressing climate change and poverty and how can they be addressed?
- The need for transformative change in society, politics and the economy is increasingly recognised as necessary to tackle the causes and consequences of climate change.
- What sort of transitions are required to address climate change and poverty, who wins and who loses and how can a just transition be enabled?

Addressing climate change, poverty and inequality requires new ideas about how society, the economy and politics work at the global and local levels.

- Whose and what visions of the future have traction, in which international, national and subnational contexts and why?

What dominant narratives exist in relation to addressing the impacts and causes of climate change and the multiple forms of poverty?

Our research practice and advocacy contribute to understanding how poverty, climate change and inequality interactfor greatest opportunity.

SCIENCE & POLICY PROGRESS

AGENDA-SETTING EVENTS

NEW KNOWLEDGE

United Nations Climate Change
UN Paris Climate Agreement

Intergovernmental Platform on Biodiversity Ecosystem Services begins
Bob Watson, UEA, Co-chair

IPCC 5th Assessment Report
Corinne Le Quéré, Rachel Warren, UEA, others

UK Climate Change Risk Assessment published
Richard Dawson, Newcastle, Rachel Warren, UEA, Ruth Wood, Manchester

1.5 & 2°C completes work for UK Government dept.
UEA, Manchester, Cardiff, Southampton

President Macron's Make the Planet Great Again
Corinne Le Quéré, UEA

IPCC 1.5°C Special Report published
Rachel Warren et al, UEA

Radical Emission Reduction Conference - Royal Society, London
Kevin Anderson, Carly McLachlan & Manchester colleagues

11th Global Carbon Budget shows emissions have flattened for 3 years
Corinne Le Quéré, Róisín Moriarty, UEA

1.5°C Conference, Oxford
Jim Hall, Oxford

Future Earth Disruptive Low Carbon Innovation Workshop
Charlie Wilson, UEA

12th Global Carbon Budget reveals rising CO_2 emissions
Corinne Le Quéré, UEA

IPCC | Future Earth Climate & Cities Conference, Montreal
Richard Dawson, Newcastle

Manchester Mayor's Green Summit
Carly McLachlan, Manchester

Adaptation and Resilience in Cities begins
Jim Hall, Oxford, with Newcastle, Southampton, Cambridge

Integrated Coastal Sediment Systems begins
Robert Nicholls, Southampton

Supergen Bioenergy Hub begins
Patricia Thornley, Manchester leads consortium

Fudan Tyndall Centre opens in Shanghai
Fudan University, UEA, Manchester, Newcastle

Wallace Initiative on Biodiversity & Climate Change begins
Jeff Price, UEA, with James Cook University

Public Values for Energy System Change published
Christina Demski, Cardiff

AVOID 1 completes for UK government dept
working with Met Office, UEA, Southampton & Reading

Radical Emission Reduction Carbon Management Special Issue
Manchester, UEA, Cardiff, Sussex, Oxford

Tyndall Low Carbon Research Working Paper
Teamwork

Sustainability for Water, Energy and Food begins
Alice Larkin, Manchester, with 8 UK universities

Tyndall Coastal Simulator book published
Robert Nicholls, Southampton, Richard Dawson, Newcastle

Low Carbon Lifestyles & Behavioural Spillover begins
Lorraine Whitmarsh, Cardiff

Feasibility of Afforestation and Biomass Carbon Capture and Storage
Naomi Vaughan, UEA, Clair Gough, Manchester, partners

Resilient Electricity Networks for Great Britain completes
Kevin Anderson, Manchester, Richard Dawson, Newcastle

Climate Resilient and Sustainable Settlements in Southern Africa begins
Mark Tebboth, UEA, Sarah Mander, Manchester, Alistiar Ford, Newcastle

AVOID 2 completes for UK government dept.
With Grantham Institute, Imperial & Met Office

Shipping in Changing Climates completes
Alice Larkin & Sarah Mander, Manchester, Robert Nicholls, Southampton

High-End Climate Impacts & Extremes completed
Asher Minns & Rachel Warren, UEA

Enhancing accessibility of data visuals
Jordan Harold, UEA

Networking grant with University of Cape Town
Sarah Mander, Manchester, UEA, Sussex

BECCS: Unlocking Negative Emissions book
Clair Gough, Manchester, Naomi Vaughan, UEA

Innovation in Environmental Governance completed.
Andy Jordan, UEA

2012 2013 2014 2015 2016 2017 2018

Building Up Resilience

Led by Prof. Richard Dawson, University of Newcastle
Prof. Rachel Warren, University of East Anglia,

Climate change is impacting human and natural systems. It poses risks to biodiversity and ecosystem services, globally and regionally. It poses risks to the global economy, to lives and livelihoods, and to businesses. It poses risks to food security, water resources, the built environment, human health and wider well-being.

Richard Dawson

Increasing levels of global warming increase the likelihood of severe and irreversible events and their impacts in the 21st century and beyond.

Rachel Warren

In order to reduce these levels of risk, both climate change mitigation and climate change adaptation are required. While mitigation can reduce global warming, not all impacts can be avoided, and adaptation is necessary.

We explore how to build climate resilient pathways that reduce vulnerabilities to climate change in a manner which is synergistic with mitigation pathways. We consider synergies and conflicts between these pathways and the Sustainable Development Goals to highlight the opportunities for actions that have benefits on multiple levels, and unintended consequences.

We explore how climate change risks accrue with different levels or warming, and assess how adaptation can be used to reduce these risks and enhance resilience. We assist climate-resilient development of human society, as well as land, water and ecosystem management.

We consider human systems, managed systems and natural ecosystems through science and stakeholder expertise. We use our cross-disciplinary expertise to consider resilience in the light of social, physical, economic, ecological and engineering challenges.

"Climate resilient pathways reduce vulnerabilities synergistic with mitigation."

- How resilient are systems are to the present day, adding longer term climate change and variability?
- What are the future impacts of climate change for different climate and socioeconomic scenarios? How can we quantify the benefits of mitigation and of adaptation?
- How do we identify timely, appropriate and cost-effective adaptation investments and ensure that these are robust to scientific uncertainties, how do we engage stakeholders to influence decision making?
- How can we improve fine resolution projections of climate change, and better project changes in climate extremes?
- What are synergies and conflicts between building up resilience, mitigation, adaptation and the SDGs?
- We fine tune the impacts of global warming on biodiversity worldwide and regionally.

An important contribution is our continued development and use of integrated decision tools, such as the Community Integrated Assessment System, and Wallace Initiative Biodiversity Maps. These tools combine information on climate projections with projections of wild species and crop distribution with land and water management and socio-

economic variables. We use them to ask 'what-if' questions for different global temperatures and explore how decisions today can lead to different decision pathways for the future. Adaptation research continues to evolve from the Tyndall Centre built Coastal Simulator and Urban Integrated Assessment Facility.

Reaching Zero Emissions

Led by Dr Naomi Vaughan, University of East Anglia
Dr Maria Sharmina, University of Manchester

A pathway towards zero emissions aligned with the goal of the Paris Agreement is more than decarbonisation of energy. Reaching zero emissions is the ability to go beyond low-carbon and actively remove greenhouse gases from the atmosphere. Decarbonisation using Biomass Energy with Carbon Capture and Storage (BECCS) and other 'negative emission' technologies.

Naomi Vaughan

Maria Sharmina

The additional challenge includes reducing emissions across the supply chain, including in the hard-to-abate sectors such as aviation, shipping, road transport, industry, manufacturing, and agriculture.

Reaching zero emissions builds on our previous interdisciplinary work of assessing the need for rapid decarbonisation within the energy and transport sector and on bioenergy production through the former Manchester-led Supergen Bioenergy Hub, all intertwined with land use and food security. We explore near- and long-term energy and emissions futures for industry, transport and negative emission technologies.

We take into account the roles of technology and industry, economic and non-economic policies, incentives, behaviours and societal changes. We assess how mitigation actions towards zero emissions interact with food security, energy security, energy access and development, material use and prosperity objectives.

"Reaching zero emissions is the ability to go beyond low-carbon and actively remove greenhouse gases from the atmosphere. "

Our approach in this theme builds on our established suite of diverse methods that span engineering, physical and social sciences. We involve stakeholders from policy, industry and civil society. We use scenario development tools to explore and understand complexities and broader issues. We evaluate the financial, environmental and social implications of zero emission futures using quantitative and qualitative methods. Our outputs include the identification of barriers and opportunities for these sectors, novel business models and recommendations for policymakers to enable rapid emission reductions.

Our key questions focus on the four sub-themes: circular economy, industry, transport and negative emission technologies, in addition to cross-cutting questions related to the Sustainable Development Goals.

Reaching zero emissions

- How does a move to zero emissions align with a prosperous society?
- How do CO_2 budgets determined by the Paris Agreement prescribe decarbonisation rates across regions, nations and individuals?
- What is the impact of zero-emissions pathways on wider SDGs and equity?

Industry

- What are the capabilities of energy, material and emission-intensive industry sectors to rethink production and material consumption?
- How do political, economic

and social systems affect these capabilities?

Transport

- What is the appropriate role of aviation and shipping in a zero-emission future?
- How do we accelerate the decarbonisation of road transport, in particular road freight?

Negative emission technologies

- What are the potentials for and barriers to realising negative emissions?
- How do negative emission technologies support the incumbent socio-economic paradigm?

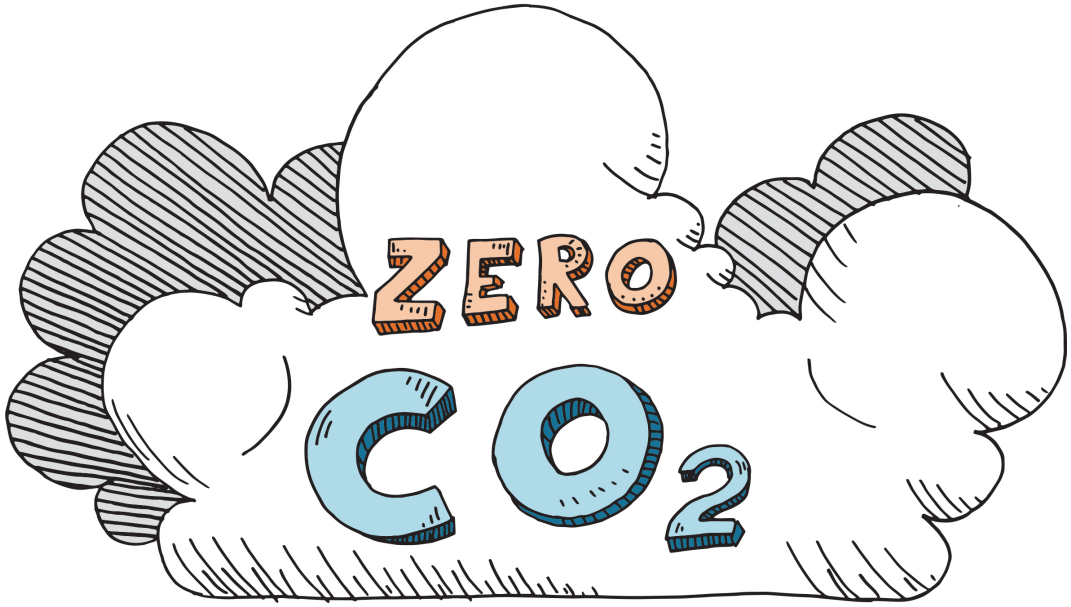
Circular economy

- What is the role of the circular economy in delivering a timely zero emission future?
- How can circular economy be integrated in the decommissioning of the incumbent fossil fuel companies and their infrastructures?

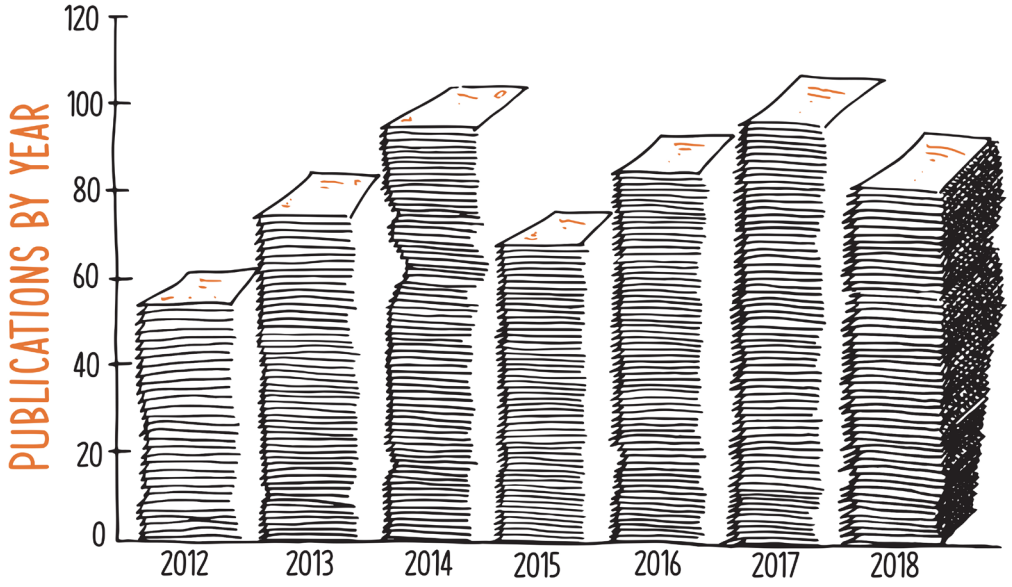
Collectively, our research, insights, practice, advocacy and arguments across these sub-themes will contribute to reaching zero emissions within global society.

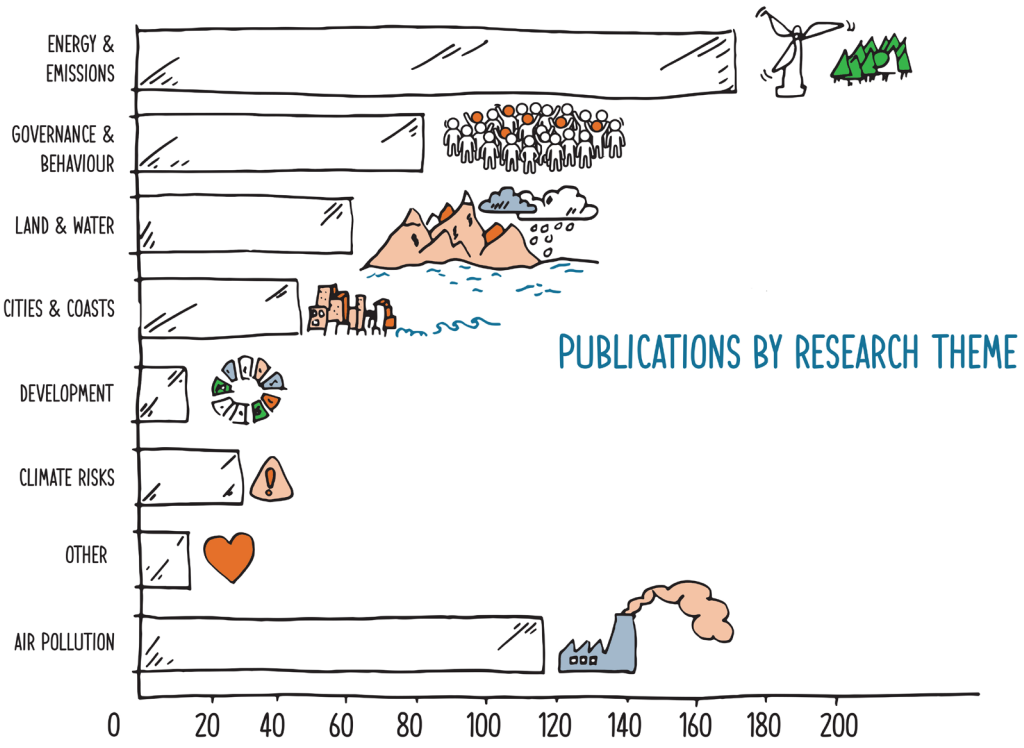
Reaching zero emissions aims to reach a range of stakeholders, including international and national policy-makers, the private sector, academia, publics and civil society, in both industrialising and industrialised nations.

Our four sub-themes (circular economy, industry, transport and negative emission technologies) differ in their ways and intensity of engagement. For example, the industry sub-theme is geared towards producers in industrialising nations, while the circular-economy sub-theme targets high-emitting consumers in already industrialised nations.

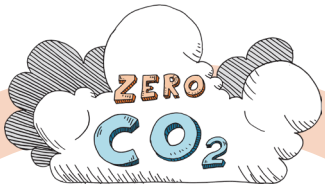


Peer-reviewed Publications 2012-2018





New Research Strategy 2018



Reaching Zero Emissions

Paris Agreement

Sustainable Development Goals

Building Up Resilience

Tyndall Centre for Climate Change Research

Overcoming Poverty with Climate Actions

Adaptation

Mitigation

Accelerating Social Transitions

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