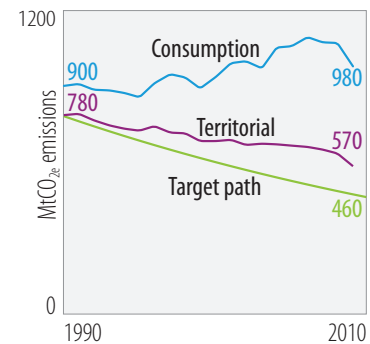
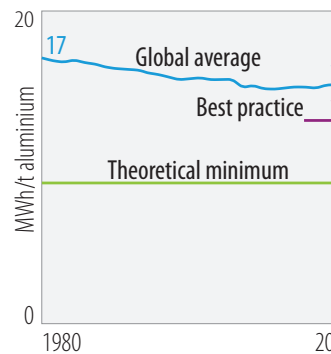
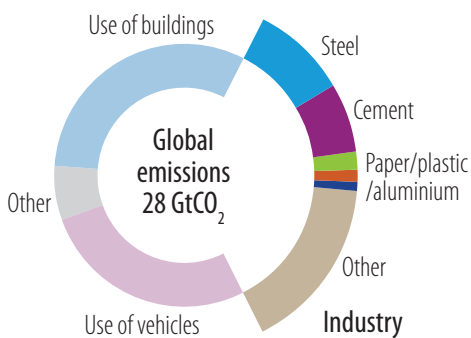


What's the opportunity?

One third of the world's energy is used in industry to make products—the buildings, infrastructure, vehicles, capital equipment and household goods that sustain our lifestyles. Most of this energy is needed in the early stages of production to convert raw materials, such as iron ore or trees, into stock materials like steel plates or reels of paper. Because these materials are sold cheaply, but making them uses a lot of energy, we are already very efficient in using energy to produce them. Therefore, the key materials with which we create modern lifestyles – steel, cement, plastic, paper and aluminium in particular – are the main 'carriers' of industrial energy, and if we want to make a big reduction in industrial energy use, we need to reduce our demand for these materials. In the UK, our recent history has led to closure of much of our capacity to make these materials, and although this has led to reductions in emissions occurring on UK territory, in reality our consumption of materials has grown, and the world's use of energy and emission of greenhouse gases has risen as our needs are met through imports.

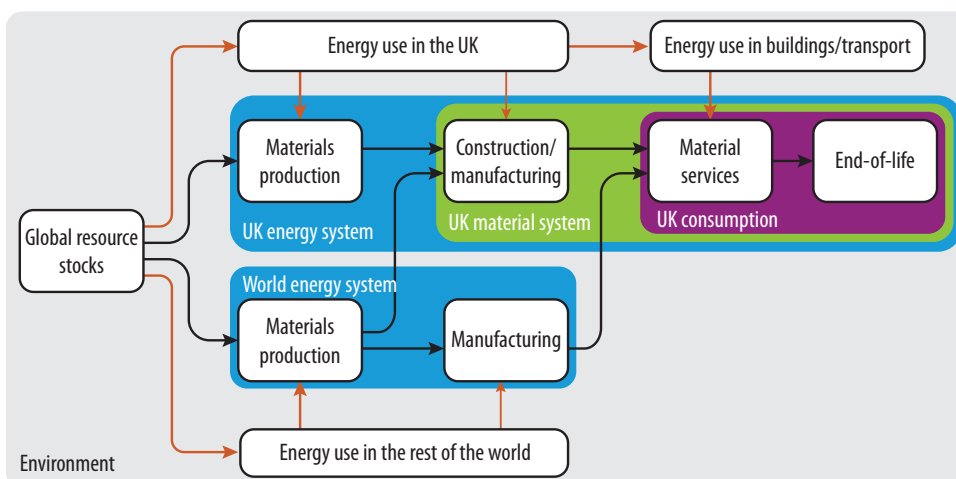


A third of the world's CO₂ emissions arise in industry, over half of which arise in making just five materials...

but we've already invested heavily in saving energy in these industries...

and in the UK, our true CO₂ footprint has increased ... but in other countries.

The **UK INDEMAND** Centre aims to enable delivery of significant reductions in the use of both energy and energy-intensive materials in the Industries that supply the UK's physical needs. To achieve this, we need to understand the operation and performance of the whole material and energy system of UK industry; we need to understand better our patterns of consumption both in households, and in government and industry purchasing, particularly related to replacement decisions; we need to look for opportunities to innovate in products, processes and business models to use less material while serving the same need; and we need to identify the policy, business and consumer triggers that would lead to significant change while supporting UK prosperity.



Energy is used in industry to make and shape materials. The UK's need for these materials depends on the design of the buildings and goods in which they're used, and in turn, this depends on the preferences of final purchasers. So, energy demand in industry mainly arises from the way that final purchasers drive design choices, and hence material production.

Who's involved

The **UK INDEMAND** Centre spans four universities, with an open consortium of industrial partners starting from four lead partners, and has connections throughout government and other stakeholder groups.

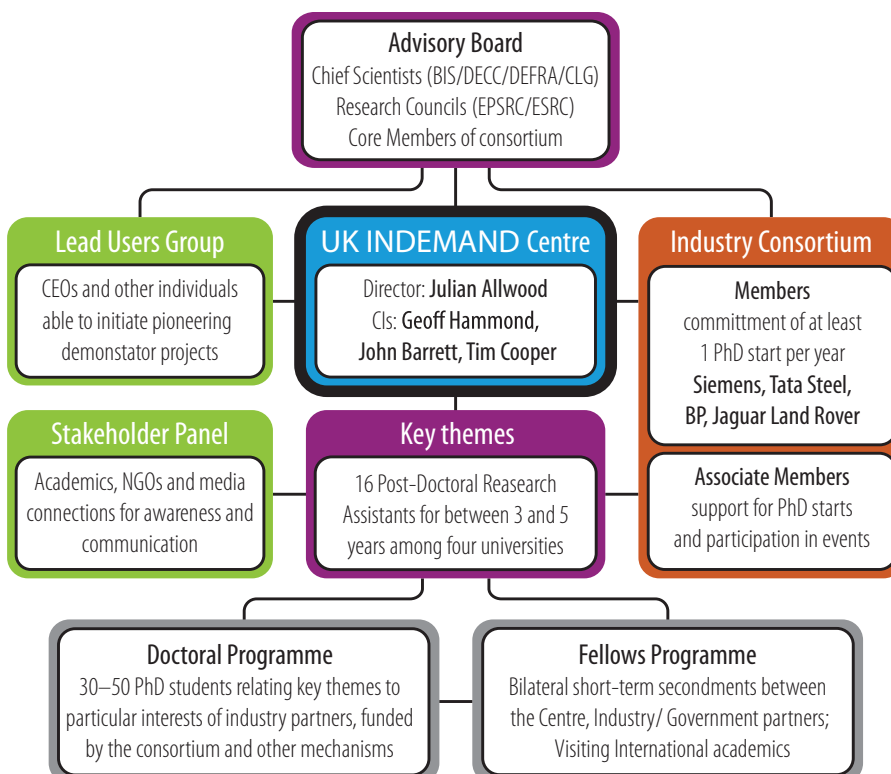
Julian Allwood (Director) is a Reader in Engineering at the **University of Cambridge**, looking at the technologies and systems of energy, material and resource efficiency. From 2009 Julian has held an EPSRC Leadership Fellowship which funds WellMet2050, an 8-person project on material efficiency in collaboration with a consortium spanning the metals supply chain. This has led to the book "Sustainable Materials: with both eyes open", online at www.withbotheyesopen.com. Julian is a Lead Author for the chapter on mitigation in industry in the IPCC's 5th Assessment Report.

Geoffrey Hammond (Co-director) is Professor of Mechanical Engineering and Founder Director of the Institute for Sustainable Energy & the Environment at the **University of Bath**. He leads both the EPSRC 'Realising Transition Pathways' Consortium and the UKERC Consortium studying 'Industrial Energy Use from a Bottom-up Perspective'. Geoff is the co-ordinator of the 'Inventory of Carbon and Energy' (ICE) widely used by practitioners for the calculation of 'carbon footprints' for products and in construction.

John Barrett (Co-director) is Professor of Ecological Economics at the Sustainability Research Institute, **University of Leeds**. His work focuses on the carbon flow in products through trade and explores how changes in demand could influence climate policy. John's research provides the official statistics for the UK on consumption-based GHG emissions. He is a core partner of the UK Energy Research Centre and is also a lead author for the IPCC's 5th Assessment Report chapter on trends and drivers in GHG emissions.

Tim Cooper (Co-director) is Professor of Sustainable Design and Consumption at **Nottingham Trent University** with interests spanning design, consumer behaviour, public policy and environmental ethics. He led the "Prospects for Household Appliances" project and is Contributing Editor of the book "Longer Lasting Products". Tim was Specialist Adviser to the House of Commons Environment Committee for its enquiry Reducing the Environmental Impact of Consumer Products.

The **UK INDEMAND** Centre will work with a committed industry consortium and all relevant government departments to ensure an effective two-way connection between research and implementation. The Centre design also includes a Lead Users Group to demonstrate change in practice and a Stakeholder panel.

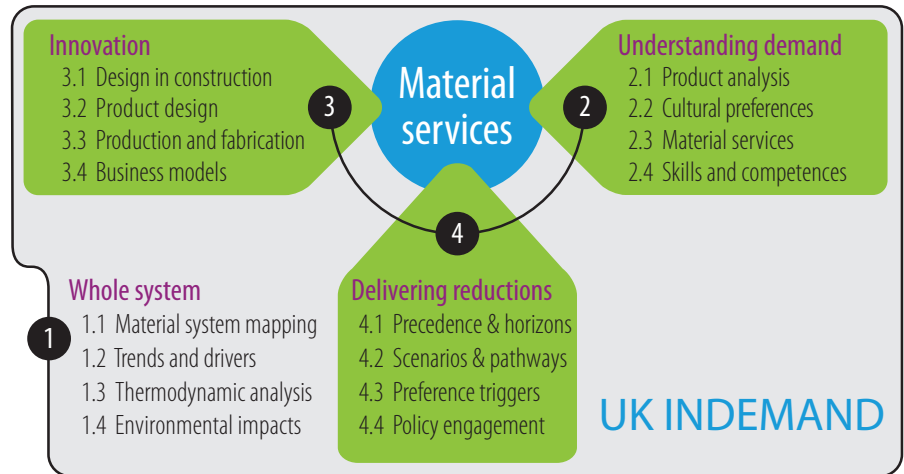


Gearing to the government's investment in the **UK INDEMAND** Centre includes support for at least 30 PhD students to connect its work to the specific interests of consortium partners. The Centre is also supported by four key government departments, the Committee on Climate Change, and a wide network of smaller organisations.

Mechanisms, including a Fellows programme for staff exchange in the UK and an International Visiting Fellows programme for global academic leaders, will ensure that the activities of the Centre are well connected to other leading activities with an interest in delivering reductions in end use energy demand in Industry.

What will the Centre do?

The UK Government's investment of £6.2m in the **UK INDEMAND** Centre through the Research Councils UK Energy programme will fund a core team of 16 dedicated researchers across the four universities, working with the four directors, collaboratively addressing four central themes of industrial energy demand reduction.



- 1. Whole systems analysis:** (1.1) Map current and forecast UK demand for materials and energy across sectors and from resources through intermediate products to final goods and services; (1.2) catalogue the drivers for energy and emissions intensities in UK industry, examine past and forecast trends, and determine barriers to improvement, and opportunities to overcome them; (1.3) use exergy analysis to specify fundamental constraints on future industrial operations, evaluate possible efficiency metrics, and explore the realities of any future 'circular metabolism'; (1.4) examine the risks associated with the coupled environmental and resource impacts of future UK industrial pathways.
- 2. Understanding product demand:** (2.1) identify the products which drive material demand, extend embodied energy methods to improve metrics of product impact and explore how these impacts influence decisions; (2.2) examine attitudes towards product lifetimes, explore how prices reflect product quality in second-hand markets, and compare purchasing decisions in businesses and government with those in households; (2.3) explore how the demand for products in providing 'material services' drives energy and material use, and could be influenced by policy levers across the supply chain of service provision; (2.4) characterise the consumer choices, skills, designs and business models of resilient repair operations, and evaluate opportunities to increase the intensity of product usage.
- 3. Innovation in delivering material services:** (3.1) identify the co-benefits of materially efficient design in construction, improve regulations and accounting practices which promote excess material use, specify and pursue demonstrator projects; (3.2) Explore critical trade-offs involved in design for material efficiency and create design guidance for product life extension; (3.3) identify, specify and value opportunities where innovative manufacturing processes could reduce end-use demand for material and stimulate their development; (3.4) Seek out, evaluate and report examples of novel business models that would promote material efficiency.
- 4. Delivering end-use industrial energy demand reduction:** (4.1) Use the techniques of precedence studies and horizon scanning to examine how potential innovations in UK industrial subsectors will influence national energy demand; (4.2) use existing futures studies to place technological innovations in product development, manufacturing and processing in the broader context of UK energy and industrial futures; (4.3) predict the conditions under which purchasers and businesses would opt for material efficiency, and examine the policy levers that might bring these preferences nearer; (4.4) Establish a "two-way" secondment programme ensuring that research findings feed directly into UK Government and Industry decision making.

This core team will also support a stream of PhD projects – funding for 30 such projects has already been committed by members of the consortium – aiming to bring about change in practice. For example such projects might involve developing new processes (e.g. to reduce manufacturing scrap), new building designs (e.g. to support module and component re-use), new business models (e.g. of leasing aluminium building components), or applying new analysis (e.g. of embodied carbon in products or trade).

How will this create change?

By exploring and pursuing opportunities to bring about significant reductions in end use energy demand in the industry providing goods for use in the UK, the **UK INDEMAND** Centre aims to contribute to meeting national emissions targets, enhance UK security, improve UK competitiveness, address UK sustainable consumption, and support UK leadership.

Our impact plan spans policy influence, business operation, technology innovations, skills development and public awareness, with an additional commitment to demonstration through facilitation a lead-user group:

Delivery of business impact: The work programme will extend the tools we have already developed for business use, including the ICE database on embedded energy and carbon, and the Foreseer tool on future resource pathways. The PhD programme will develop projects with specific industry partners, we will have set up a mechanism for two-way exchange of staff between the Centre and partner organisations, and we will run briefing days for existing and potential industry partners.

Delivery of policy impact: We will expand our existing connections with BIS, DECC, CLG and DEFRA, through the two-way fellows programme and by exchange of information on consumption and impacts, scenario analyses, business-based evaluation of policy options and macro-economic forecasting. We will respond to calls for evidence, engage with relevant NGOs and think tanks, and will be making direct input to the processes of the Committee on Climate Change. We are already engaged in international policy bodies including the IPCC, EU and UNEP, and will continue to develop these links.

Demonstrators of reduced material demand: many opportunities for material efficiency involve small increases in cost in return for substantial material savings. We will seek out and support a lead-user group of senior CEOs and group or individual sponsors able to act as pioneers in the area.

Delivery of public awareness: Our proposal includes funding for a half time communication officer to deliver public communications through books, short internet videos, a website, conventional media, a schools programme and to explore other relevant channels where possible.

Delivery of education: The Centre will provide training and mentoring for the team of PDRAs and the associated PhD programme, executive education through Cambridge Programme for Sustainability Leadership and others, materials for undergraduate and masters level education, will involve current masters and undergraduate students through dissertations, and connect to the UKERC summer-school.

Collaboration and connections: We have established an extensive network to ensure the Centre is well connected – within our own universities, with Government departments, UK agencies such as WRAP and Carbon Trust, and other UK and international academics, institutions and networks. The Centre's communication officer will explore opportunities to share insights with the wider public through the website, through material developed for schools, and through other media as appropriate.

Delivery of knowledge: In addition to the normal channels of communication used in universities, we will be holding 'outreach' events to expand our inter-disciplinary connections across the UK research community, and have set up an International Visiting Fellows programme to support in-coming visits from internationally leading academics. The individual investigators are partners in several other UK research collaborations, and we are strongly connected to the four other centres of End Use Energy Demand reduction initiated at the same time as the **UK INDEMAND** Centre.

For further information

The **UK INDEMAND** Centre will run from 1st July 2013 for 5 years in the first instance. The Centre website will be launched at www.ukindemand.com. Meanwhile please contact Julian Allwood, jma42@cam.ac.uk, 01223 748271.

