

# Transfer for Transition: Increasing Productivity and Competitiveness in a Low Carbon Economy

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## Abstract

*It is now widely accepted that there is a need to reduce CO<sub>2</sub> emissions and other greenhouse gasses in order to mitigate global climate change. Coupled with this need is the additional challenge of maintaining security and continuity of energy supply and dealing with the problem of resource depletion, in particular peak oil. In response to these needs, the UK government has signalled its intention to move towards a low-carbon economy. This transition will have implications for the productivity and competitiveness of both public and private sector organisations. As a result, there is a need for organisations to prepare for a low carbon future and exploit the opportunities that may arise. The challenge for many is that they often do not possess the internal skills and knowledge to enable them to transition to more sustainable working practices, or exploit new low carbon opportunities.*

## 1. Introduction

It is now widely accepted that there is a need to reduce CO<sub>2</sub> emissions and other greenhouse gasses in order to mitigate global climate change [1]. The overwhelming majority of scientific opinion now recognises that the Earth's climate is changing, due in large part to emissions of greenhouse gases (GHGs) from anthropogenic activities such as the production of energy from fossil fuels [2-4]. It is also agreed that the impacts of climate change are likely to be substantial, posing a serious threat to human society and the natural environment [1],[3]. Coupled with this need is the additional challenge of maintaining security and continuity of energy supply and dealing with the problem of resource depletion, in particular peak oil.

In order to deal with these issues, the UK government has established the long term objective of moving towards a low carbon economy [5]. This transition will inevitably have implications for the productivity and competitiveness of both public and private sector organisations, but it will also present significant new opportunities. Evidence suggests that many business do not yet possess the skills, knowledge and capacity to make the transition to a new low carbon way of working, or exploit new

market opportunities as they arise [6],[7]. The challenge for organisations is how they should prepare for the low carbon economy. One solution to developing new skills, products, or processes is to utilise the skills and knowledge embedded within UK universities through a Knowledge Transfer Partnership (KTP). The aim of a KTP is to transfer specialist knowledge from within an academic institution into a private or public sector organisation, with the advantage that once the KTP ends, the knowledge, skills and capacity built up during the partnership will remain within the organisation.

Knowledge transfer can offer organisations the chance to improve efficiency and productivity by reducing rework, avoiding re-inventing the wheel and improving the utilisation of best practices to facilitate continuous improvement and innovation. It also offers organisations the chance to gain competitive advantage by learning new processes, introducing new technologies and working practices and promoting best practice throughout the business. Those organisations which have built the internal capacity to adapt and change to meet the challenges of operating within a low carbon economy can minimise the threats to their business and are more likely to be best placed to exploit the opportunities that will inevitably arise.

This paper will provide an insight into how knowledge transfer can be used to increase competitiveness and productivity in a public sector organisation and its private sector partners. It draws on the experiences of a KTP between Northumbria University and North Tyneside Council which aims to increase the technical knowledge and skills in the local authority with regard to specifying and operating low carbon renewable energy technologies.

Initial findings suggest that the knowledge and skills transferred to the local authority through the partnership are already building the capacity within the organisation and its partners enabling them to avoid the threats posed by the shift to a low carbon economy and exploit the opportunities.

## 2. Environmental Threats

The UK Government's plan to move the country to a low carbon economy comes as a response to the threats posed by environmental and geopolitical issues such as resource depletion, security of energy supply and global climate change.

The issue of resource depletion is best demonstrated by the debate surrounding 'peak oil', a phrase used to describe the situation when global oil production reaches a peak, following which oil supplies decrease until exhausted. Many fear that this peak has already occurred or will have occurred by the year 2015 [8-10]. Meanwhile, demand for oil continues to increase. The same is true for other fossil fuels such as coal and gas with estimates placing peak coal to occur at around 2025 [11],[12], and peak gas at around 2020 [9]. The result is a lack of the fuel from which society derives the energy to power homes and businesses, fuel the transport system, and manufacture goods, many of which are derived from fossil resources such as oil.

Similar concerns are raised over the security of the UK's energy supply [13],[2],[14]. The decline of fossil fuel reserves such as those in the North Sea, and the fact that the UK's current nuclear power stations are approaching the end of their lives and are due to close, has meant that the UK has become a net importer of natural gas, and increasingly reliant on imports of other fuels such

as coal from Poland [2],[15]. These imports often come from regions affected by political instability such as the Middle East, or countries such as Russia who may wish to use their resources as a bargaining tool for furthering their own political interests [9],[16],[17],[14]. The result is higher energy prices, and increased possibility of power outages, both of which pose a serious threat to society and the economy. For business, the threat comes from a lack of competitiveness due to high fuel and commodity prices.

But perhaps the overriding driver resulting in the desire to transition to a low carbon economy is the threat posed by global climate change. The overwhelming majority of scientific opinion now recognises that the Earth's climate is changing, due in large part to emissions of GHGs from anthropogenic activities such as the production of energy from fossil fuels [1-3],[18]. The impacts of climate change are likely to be substantial, posing a serious threat to human society and the natural environment [1],[3]. The effects of climate change can already be seen, for example, increases in severe weather events such as hurricanes, heat waves, extreme precipitation or snow fall. These events present serious problems to society, and organisations whose operations are affected by not being able to transport goods or run services, or from increased sickness in employees working in extreme cold or hot conditions, and damage to infrastructure or assets such as buildings.

## 3. The Low Carbon Economy

It is now accepted that a shift to a low carbon economy is necessary to mitigate, and adapt, to the risks posed by climate change, resource depletion and energy security [19]. The Government's Energy White Paper, "Our energy future – creating a low carbon economy" sets out the way in which the country will transition to a new low carbon way of working [13]. The paper concedes that for many, such change will be a challenge, and commits the Government to work with business to help them prepare for the low carbon economy and exploit the opportunities that arise [13]. It also states that such a transition should be achieved without detriment to UK competitiveness or productivity [13]. Competitiveness concerns arise around the use of CO<sub>2</sub> and GHG budgets and the policies

required to achieve them. If too tough, they could endanger specific sectors in internationally competitive markets resulting in a loss of profits and jobs as organisations relocate outside of the UK [20]. However there are also likely to be benefits from a low carbon economy in new business opportunities and increased employment [20].

The recently published UK Low Carbon Transition Plan [21] sets out a range of challenging targets designed to stimulate business opportunities and job creation in high growth, low carbon sectors [21]. There are several areas where companies can look to capitalise on the drive towards the low carbon community. Organisations will need to beat their competitors in order to remain competitive by reducing exposure to climate-related risk, and finding new business opportunities within those risks [22]. First, there are efforts to optimise the carbon efficiency of existing products, services, assets, infrastructure (such as buildings and supply chains [23]. This can involve measures to improve energy efficiency, reduce energy demand and a transition towards low and zero carbon sources of power such as wind, solar and ground source heat [23]. Secondly, demand is increasing for low carbon technologies and supply chain solutions that can assist both public and private sector organisations reduce their emissions [23]. Industries based upon supply of biomass to power plants, or low carbon transport options are ideally placed to capitalise. Third, both these developments are being driven by higher energy prices and increased regulation, both of which are here to stay.

To ensure competitive advantage, UK organisations need to invest in the skills and knowledge that will be essential in a low carbon economy [6],[24]. However evidence shows that many UK organisations do not have some of the necessary skills, or training in place, to make the transition [6],[7]. The challenge for both private and public sector organisations is how to remain competitive and maintain productivity, in the face of these multiple challenges. Organisations are increasingly becoming aware of the need to adapt to a low carbon future, but in many cases do not possess the skills or capacity to begin developing strategies to mitigate the risks post by environmental threats, and capitalise on the opportunities.

#### **4. Building skills and capacity**

There are a number of ways in which knowledge which is lacking within an organisation can be attained, such as creating new job roles, staff training and development or using external consultants. However it is debatable as to whether any of these approaches actually deals with the real issue of how to develop skills, knowledge and capacity which can be integrated throughout the organisation, rather than as an add-on [25]. Environmental adaptive capacity can be created in a number of ways; investing in the production of information and knowledge; increasing financial resources in areas where they are currently lacking and encouraging change within institutions permitting learning to be incorporated as a core value [26].

The production of information and knowledge can be achieved by investing in additional staff who already possess the skills and knowledge required to aid in the transition to a low carbon economy. This approach can prove costly to organisations that need to fund the recruitment, salary and on costs of new staff members, particularly at a time of recession where companies are looking to reduce staffing levels [25]. Another method is to buy in short term knowledge when an organisation does not have the internal capacity to undertake work in a particular area from external consultancies. Consultants, used correctly and in appropriate circumstances can provide substantial benefits to organisations. However used incorrectly, consultants can drain budgets rapidly with no real productive results [27] and the quality of consultant advice can vary greatly within and between consultancy firms. The main problem with this approach is that the knowledge and expertise usually leaves with the consultant [25].

Skills and knowledge can also be created by increasing, and targeting financial resources. For private sector organisations this could mean investing in alternative transportation or manufacturing infrastructure which does not rely on fossil fuel sources of energy, or putting money into new products or services that capitalise on new low carbon opportunities. For the public sector organisation this could mean investing in initiatives such as small scale renewable energy or recycling programmes designed to enhance

the adaptive capacity of communities. However this approach, whilst having merit, assumes that finance is available, and can be in danger of externalising environmental issues and placing the responsibility away from the organisations core operations [25].

The transition to a low carbon economy is a long term plan, and so it is it is perhaps better to ensure that the knowledge and skills required to ensure organisations remain productive and competitive become an integral part of organisational culture, and that learning is incorporated as a core value [25]. This can be achieved by investing in staff training and development, however this again requires often substantial financial investment and it can be difficult to engage all staff members fully in a programme of training. Changing organisational culture in itself can be an extremely difficult task and usually relies on those at the top of the organisation being informed, willing and able to support and communicate change.

One method which can go some way to satisfy these multiple adaptation pathways and assist organisations in developing the capacity to respond to environmental challenges, and prepare for the Low Carbon Economy, is the Knowledge Transfer Partnership.

## **5. Transfer for transition**

Recently there has been a move towards the notion of 'knowledge transfer' from universities to industry in order to secure economic benefits [28]. Increasingly 'knowledge transfer' is being used to transfer knowledge from universities to public sector organisations such as local authorities in order to secure social as well as economic benefits. However, this knowledge transfer may be more appropriately termed 'knowledge exchange' [28] as the relationship is a two way one where knowledge, capacity and skills flow not only from the academic institution to the industry partner, but also back from the partner to the academic organisation. The role of knowledge transfer is recognised by the Government in a recent report from the Council for Industry and Higher Education [29] which indicated that universities will be pushed to develop relationships with public and private organisations to improve the transfer of research

knowledge and innovation into the commercial world and local government.

The KTP is a government funded scheme, administered by the programme management company Momenta, which involves a high calibre graduate (KTP Associate) working within an organisation with the backing and supervision of an academic institution [30]. The result is strategic advantages for the organisation, academic outputs for the University, and valuable training and industry experience to the Associate. The aim of a KTP is to transfer specialist knowledge from within an academic institution into a private or public sector organisation [30]. Such knowledge generation and focus on learning has now become a central issue in environmental capacity building and adaptation [31].

The advantage that a KTP has over the more traditional knowledge generation routes is that, through the Associate, the organisation can draw upon the often substantial knowledge skills and resources of the University. Also, once the KTP ends, the knowledge, skills and capacity built up during the partnership will remain within the organisation rather than leave with external consultants. This in itself strengthens the process of building resilience to environmental problems within an organisation and subsequently the wider community [32]. There is also the advantage that by having an Associate embedded in the organisation, they act as a conduit to other to learn about the Associates particular interest and field simply through office chat and observing their work [25].

There are, of course, disadvantages to using KTP as a means to transfer knowledge into an organisation, in particular a public sector organisation, One of the primary focuses of KTP is to create financial benefits to the host organisation. This focus has led the language and structure of the partnership to be geared to profitmaking business, an approach which does not necessarily lend itself to public sector organisations [33]. This can make measuring the success of the KTP more difficult. Another disadvantage is that a KTP is only funded for a limited period of time and thus if a project runs over schedule for whatever reason, the company either has to fund the extension internally, or terminate the partnership and accept that not all

expected outcomes will be met [33]. There can also be problems for the associate, who receives supervision and support from a representative of both the academic knowledge base, and the host company, if both partners have conflicting priorities [25]. However, if carefully managed, the links which can be established through the KTP can be nurtured and retained well beyond the lifetime of a specific project enhancing knowledge, learning and capacity throughout both the academic institution and the public/private sector host organisation.

## 6. Case study

North Tyneside is a metropolitan borough of Tyne and Wear in the North East of England. One of the key policy objectives of the local authority is to transition to a low carbon economy by 2020. The council has been tasked with improving and increasing its' social housing stock in order to reduce the vulnerability of its tenants from fuel poverty and climate change. In particular the authority is working to replace its ageing sheltered accommodation for people over 65 which does not meet modern decent homes, spatial and environmental standards. In order to achieve this, the council made the strategic decision to bid for central government PFI funding.

The authority was successful in its bid and was awarded just over £112M to contribute to the procurement of high quality, sustainable homes. The project, titled Quality Homes for Older People, is aimed at refurbishing and rebuilding all sheltered housing in the borough. In doing the project so aims to reduce overall energy use, reduce greenhouse gas emissions and maximise potential for renewable energy in line with the authorities low carbon aspirations. The project also aims to meet the social care targets of the authority by reducing the number of elderly people vulnerable to fuel poverty and extreme weather events such as heat waves and increasingly cold winters.

Early on in the project, the authority recognised that it lacked the knowledge, expertise and experience in low carbon technologies and strategies, but instead of taking the conventional route of using external consultants to fill the knowledge gap, initiated a Knowledge Transfer

Partnership (KTP) with Northumbria University. The aim of the KTP is to build capacity and knowledge in the local authority with regard to specifying and operating low carbon renewable energy technologies, and assist the authority in its goal of creating a low carbon economy. The strategies, skills and knowledge will then be disseminated through the local authority, in particular it's planning regime, regeneration team and energy strategists. In addition, the knowledge generated is filtering down to private sector organisations through the authority's advisory role assisting local business in developing the skills required to survive in a low carbon economy.

Skills and knowledge are also being transferred to the private sector consortia bidding for the PFI project. The KTP Associate is embedded in the council project team on a full time basis and acts as the conduit for knowledge transfer between all of the project stakeholders. The Associate can transfer knowledge and low carbon strategies developed at the university to the bidders whilst examining their success in the context of a real life situation. This in turn contributes to the Universities research output and produces case studies to enhance teaching and further embed low carbon working techniques.

Initial findings suggest that the knowledge of the project team members about environmental issues and low carbon energy systems and strategies has been greatly enhanced. As a result developers bidding for the PFI contract have in begun to focus on innovative approaches to energy system development. This represents an improvement over the initial position of the bidders which saw them reluctant to engage fully in the sustainability aspects of the project. One of the reasons for this is that the new knowledge and skills now inherent in the council project team has enhanced their ability to explain the rationale behind the local authority's decision to promote decentralised low and zero carbon renewable sources of energy. The message being conveyed to the private sector bidders is that the team is keen to work in partnership with them to developing new low carbon solutions.

It is hoped that private developers, through becoming early adopters of low carbon technologies and developing expertise in low carbon strategies, will gain a commercial

advantage over their competitors. This will result in them being ideally placed to exploit the new and exciting opportunities the low carbon economy will bring.

## 7. Conclusion

The transition to a low carbon economy in the UK will have both negative and positive implications for the productivity and competitiveness of both public and private sector organisations. Competitiveness concerns arise around the use of CO<sub>2</sub> and GHG budgets and the policies required to achieve them. If too tough, they could endanger specific sectors in internationally competitive markets resulting in a loss of profits and jobs as organisations relocate outside of the UK. The positive benefits from a low carbon economy can result in new business opportunities, in particular in the low carbon technologies sector, and the increased employment opportunities that this will bring.

However, it is clear that in many cases, UK organisations do not possess the skills necessary to enable them to avoid these negative implications, and exploit the opportunities. There is then, a need for organisations to develop new skills, products and working practices, and identify new opportunities.

This paper concludes that KTP may be a useful pathway through which both public and private organisations can gain the knowledge and skills required to transition to a low carbon economy. It has described how a KTP between Northumbria University and North Tyneside Council is seeking to enhance both private and public sector organisations capacity to transition to a low carbon economy. The work will continue to explore how knowledge transfer can assist in the development of low carbon skills and improve organisations productivity and competitive advantage.

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