



## **Renewable Energy Strategy Consultation**

*Comments by*

**Northern Ireland Environment Link**

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Northern Ireland Environment Link is the networking and forum body for non-statutory organisations concerned with the environment of Northern Ireland. Its 51 Full Members represent over 85,000 individuals, 262 subsidiary groups, have an annual turnover of £100 million and manage over 314,000 acres of land. Members are involved in environmental issues of all types and at all levels from the local community to the global environment.

These comments are agreed by Members, but some members may be providing independent comments as well. If you would like to discuss these comments we would be delighted to do so.

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## **Welcome to the Renewable Energy Strategy**

Northern Ireland Environment Link (NIEL) welcomes the publication of the draft renewable energy strategy for consultation. NIEL believes that the consultation process should be an important component of policy development and that investment in the consultation process will ultimately improve the final policy.

The Minister for Enterprise Trade and Investment in Northern Ireland has encouraged stakeholders in Northern Ireland to respond to the BERR consultation and to provide her Department (DETI) with copies of their response. With this in mind NIEL has used the opportunity to comment generally on the consultation document but also to make specific comments on Northern Ireland issues; even if they are matters for the devolved administration.

The strategy represents a important step towards achieving the ambitious target of 15% of our energy being produced from renewable sources by 2020. The Government must use this opportunity to ensure that the United Kingdom's greenhouse gas emissions significantly reduce year on year. It is encouraging that the strategy focuses on improving energy efficiency and reducing energy demand as a way to meet this target. It is also unquestionable that renewable technologies will need to be utilised and developed to a much greater extent than at present.

While it can be argued that a policy framework to adapt to and mitigate climate change is beginning to develop in the United Kingdom the same level of progress is not being made in Northern Ireland. The Assembly's support for the UK Climate Change Bill is welcome but there is little to suggest that the Northern Ireland Assembly is committed to reducing emissions in Northern Ireland. A Northern Ireland Climate Bill with specific mandatory reduction targets should be introduced to act as the driving force towards a low carbon society. The UK Government should be applying pressure on the Northern Ireland Assembly to introduce this Bill and should ensure that EU targets such as the *15% energy from renewables by 2020* are also achieved in Northern Ireland.

Legally binding carbon reduction strategies and targets at the devolved level should include the specification of emissions reductions sector by sector, and the instruments by which government will ensure that each sector will stay within its carbon budget. This would:

- Translate the commitment to make a fair share reduction into policy.
- Curtail debates as to *whether* to cut emissions and enable the focus to be on *how* they should be cut, thus making the task more politically straightforward.
- Ensure that Northern Ireland benefits from the economic, social, and environmental gains to be derived from cutting carbon emissions.

Carbon emissions from Northern Ireland and the Republic of Ireland are closely interlinked, especially through the single electricity and gas markets and the legitimate cross-border trade in road fuel purchasing. A Climate Protection Act has been proposed for the Republic and is similar in its purpose to the UK Climate Change Bill. This represents an opportunity to jointly pursue emissions reduction goals, specifically through sharing of knowledge and expertise between the two independent experts' bodies proposed under each piece of legislation, enabling the two administrations to work together on joint policy goals. The Council of the Isles should also play a higher profile role in tackling climate change, particularly by co-ordinating mitigation and adaptation measures across member regions.

## Renewables Energy and Climate Challenge

The science of climate change is now well established and the evidence to suggest that urgent action is needed is overwhelming. For example:

- The Intergovernmental Panel on Climate Change (IPCC), a group containing over 2500 scientists, reported (AR4) that 'warming of the climate is unequivocal' and that 'most of the observed increase in temperature is very likely (90%) due to human activity'. The findings of the IPCC are also supported by the Academies of Science of the 11 largest countries in the world, including the Royal Society of London.
- The Stern Review calculated that the dangers of unabated climate change would be equivalent to at least 5% of GDP each year. However, when more recent scientific evidence is included in the models, the Review estimates that the dangers could be equivalent to 20% of GDP or more. In contrast, the costs of action to reduce greenhouse gas emissions to avoid the worst impacts of climate change can be limited to around 1% of global GDP each year. The central message is that reducing emissions today will make us better off in the future: one model predicts benefits of up to \$2.5 trillion each year if the world shifts to a low carbon path.
- The recent SNIFFER report on the impacts of climate change on Northern Ireland identified a number of direct effects, mostly negative, on human health, the economy, natural habitats and water resources.

Our scientific understanding of climate change is evolving but it is UK and EU policy that in order to prevent the most dangerous effects of climate change global temperatures should be stabilised at no more 2°C above pre-industrial levels. The Government's climate policy "Climate Change – The UK's programme 2006" stated: *"in the mid-1990s the EU proposed that the aim should be to limit global temperature rise to no more than 2°C to avoid dangerous climate change ... At that time, it was thought that this equated to atmospheric carbon dioxide levels below approximately 550 ppm. The more recent work of the IPCC suggests that a limit closer to 450 ppm or even lower, might be more appropriate to meet a 2°C stabilisation limit."*

The UK Government has established its reduction target based on the higher carbon dioxide limits and it must, therefore, be revised (i.e. to at least an 80% reduction). The Government must also recognise that as carbon dioxide persists in the atmosphere for many years, the real determinant of the severity of climate change is not emissions *in* 2050, but total cumulative emissions *by* 2050. Therefore, not only must emissions reduction targets be increased (above the 60% currently in the UK Climate Change Bill) they must also be achieved much more quickly than proposed in the Bill. The Tyndall Centre has estimated that as global carbon emissions are rising so fast that they would need to peak by 2015 and then decrease by up to 6.5% each year for atmospheric CO<sub>2</sub> levels to stabilise at 450ppm, which might limit temperature rise to 2°C.

Northern Ireland currently generates only 5% of its **electricity** from renewable sources. Of Northern Ireland's **energy** usage (for electricity, **heat** and **transport**), indigenous renewables account for less than 1% of the total. The rest of our energy comes from fossil fuels, highlighting the massive challenges we face in achieving the European targets. The extent of Northern Ireland's high emissions lifestyle was highlighted by an Energy Savings Trust report issued on 26 November 2007. The report found that household (including transport) emissions in Northern Ireland are 39% above the UK average and that the 12 worst performing authority areas were in

Northern Ireland and all of the Northern Ireland councils were near the bottom of their table (Green Barometer III).

There is huge potential for renewable energy generation in Northern Ireland. Macro-wind (Airtricity currently has plans to build a 10GW wind-farm, which could supply enough power for eight million homes) and tidal current (it is estimated that the UK has a 70 TWh/year marine energy resource) energy offer the most potential for renewable energy generation, with solar, geothermal, anaerobic digestion (the RICS has suggested that 30% of Northern Ireland's vehicle fuel demand or 16% of its heat and power demand could be supplied by anaerobic digestion of biodegradable waste), small-scale hydro and wind, biofuels and CHP from biomass all likely to contribute to the energy mix.

### **Saving Energy**

Our demand for electricity in Northern Ireland is growing: DETI estimates that, on average over the last 15 years, electricity consumption has increased by 1.8% per annum. The Northern Ireland Sustainable Development Strategy includes a target to (from 2007) "reduce consumption of electricity by 1% annually until 2012." By reducing demand for energy we also make achieving the renewable energy target easier as developers faced with the 'Merton Rule' will testify: developers having to embed a percentage of on-site generation as a condition of planning permission found that it was in their interests to reduce the overall energy demand of the project as they did not have to install as much capacity. There is still a great deal to do in Northern Ireland with regard to energy efficiency. Recent improvements to Part F of the Building Regulations are welcome but must now be improved further.

NIEL is particularly supportive of the recent proposal to provide a rates rebate to households that carry out energy efficiency improvements. Approximately 500,000 homes in Northern Ireland have either no loft insulation or have insulation below the recommended levels of 270mm while some 70,000 homes would benefit from cavity wall insulation. The Assembly, and the UK Government, should also set annual targets to upgrade a stated percentage of the existing housing stock to the recommended insulation levels and a stated percentage to 'zero-carbon' standards. A similar scheme exists in Germany. If the rates rebate and tax exemption schemes are not delivering these targets further measures should be introduced.

It is important that the Assembly adopt the UK goal for all new homes to be zero carbon by 2016. The introduction of a mandatory microgeneration requirement for new buildings should act as a useful initial step, with the caveat that if onsite generation is impossible off-site contribution be permissible. This would represent a reversal of the previous decision to abandon this policy by the former Minister for Finance and Personnel.

Between 8,000 and 10,000 new houses are built every year in Northern Ireland. These houses are currently being built to sub-optimal standards and will be heated and powered by ever more expensive fuels. The rest of the UK and the Republic of Ireland are intent on improving their building standards and we should not lag further and further behind. This is the time to raise housing standards, reduce fuel costs in the new build sector and encourage the next wave of successful Northern Ireland companies.

### **Centralised electricity**

Large scale renewable energy projects will play a vital part in reducing Northern Ireland's carbon footprint, but only if supported by appropriate planning, fiscal and environmental policies. The current renewable electricity market in Northern Ireland

is dominated by wind. This is unsurprising as the technology is proven and competitive, and the wind resource is abundant.

The Northern Ireland Sustainable Development Strategy (NISDS) sets the target that, “beyond 2025 40% of all electricity consumed in Northern Ireland is obtained from indigenous renewable energy sources with at least 25% of this being generated by non-wind technologies.” It can be assumed that the further development of terrestrial wind farms will play a significant role in reaching our renewable targets but energy from offshore wind farms, tidal, wave, solar, biomass, hydro and geothermal will also be essential. In facilitating further wind development, due regard must be given to facilitating and promoting further diversification of the renewable energy resource.

The recently released Planning Policy Statement 18 is expected to provide a boost to renewables generation in Northern Ireland. NIEL supports the overall aim of PPS 18: *to encourage and facilitate the provision and siting of renewable energy generating facilities in appropriate locations within the built and natural environment*. However, the imperative for utilising renewable energy must not be used to justify bad schemes in the wrong area. The draft supplementary guidance to PPS 18 provides additional direction on how to incorporate wind energy development in Northern Ireland’s landscapes. NIEL believes that, final decisions on wind energy development should be made based on the full range of environmental and technical considerations, including landscape sensitivity.

PPS18 does not apply to off-shore development proposals, yet an integrated, comprehensive approach to planning for all renewables is required. NIEL would emphasise that the planning system for renewable energy sources must be applied not just to the terrestrial environment but also to the marine environment. Marine Spatial Planning (MSP) is a key element of the Marine Bill and it is essential that all government departments with responsibilities for the marine environment account for the role that MSP is likely to play in the management of any/all marine related plans and developments. The visual impact (from land and at sea) of offshore wind farm developments must also be considered in the approval process.

The level of the Renewables Obligation in Northern Ireland remains an area of significant concern to NIEL. While there may have been some justification for a lower Obligation in the past, the ever increasing cost of fossil fuels and the potential supply of renewable energy in Northern Ireland should lead to the recognition that a higher Obligation will bring long term economic benefits. The present Northern Ireland energy mix is not sustainable and the issue should be addressed urgently; a higher obligation is one way to stimulate this. We feel that it is essential that the NIRO target is set at 13% for 2012; which is the Government’s 2012 renewable energy target plus 8% headroom. In the longer term the target should be set higher, for example, at 43.2% for 2025 (in order to meet Sustainable Development target and allow headroom).

The recent All Island (Ireland) Grid Study suggested that 42% of our energy could come from renewable sources without a substantial increase (7%) in cost compared to continuing with our current energy mix. It is important to note that oil prices have gone up significantly since the calculations were made. Northern Ireland should now be investing heavily in renewable energy to meet its targets but also to maximise the potential for economic benefits.

## **Heat**

It is estimated that 81% of energy consumed in Northern Ireland, excluding transport, is used for space heating and hot water in buildings and in commercial and industrial

uses. Oil is by far the most utilised fuel for heat generation in Northern Ireland, with CHP and small scale renewable heat technologies providing a tiny contribution to the total fuel mix. Therefore, the encouragement of renewable heat sources, such as geothermal or biomass, and development of CHP as a significant source of energy for either business or domestic use, should be an important element of the new Strategy. NIEL would encourage Government to look at ways to encourage community heating and local electricity generation, in both new developments and existing communities, through price incentives.

### **Distributed Energy**

Large scale renewable projects and microgeneration should both be utilised. The development of microgeneration capacity and local energy networks (for heat and electricity) has many benefits over the traditional electricity grid. Large scale plants waste much of the energy in their fuel source by not utilising 'waste' heat and through the electricity lost in transmission and distribution systems. Decentralised systems can be much more efficient, especially when there are local markets for heat and electricity. Smaller generating units with more diverse fuel supplies could improve Northern Ireland's energy security and provide a vital income for a number of people.

The Department of Finance and Personnel decision in November 2007 not to pursue mandatory microgeneration limits the development of renewable technologies and perhaps energy efficiency in Northern Ireland, therefore, should be reversed. A recent report from the Renewables Advisory Board (RAB) provided the first in depth analysis of the role of onsite energy generation in the delivery of the Government's policy of ensuring that all new homes are zero carbon from 2016. Amongst its conclusions is that the policy could drive a market for onsite renewables worth £2.3 billion a year from 2016 ([RAB Report](#)). However, the report also warns that the capacity of the microgeneration industry must be developed now and that it will require support to drive innovation and competitiveness.

The RAB report also states that the average cost of meeting zero carbon standards from on site renewables is expected to be £6,000 per dwelling. This price can be passed on to the customer without significantly affecting the final house price as the buyer will benefit from stamp duty relief. The occupant will also benefit from the annual fuel bill savings (this is particularly relevant as over 300,000 people in Northern Ireland are in fuel poverty due to increasing fuel costs and poor housing quality) and from rates relief. Microgeneration would also be made more attractive if generous feed-in-tariffs for energy sold to the grid were introduced in Northern Ireland.

NIEL feels that the most significant positive step that could be taken to encourage greater adoption of renewable technologies at the 'micro' scale is development of a system of 'feed in tariffs' which change the balance of costs/benefits for generation from the current situation where microgenerators receive a lower price for the electricity they generate and feed into the grid than they pay for the units they use to 'top up' their generation. This situation should be reversed, as is the case in other countries (e.g. Germany) where it has been shown to be the single most effective incentive for greater adoption of renewables on a small scale. If potential renewable generators are guaranteed a differential for any excess energy they generate this provides a more powerful, long term incentive for installation and shifts the cost-benefit analysis equations and the pay back periods to encourage much greater installed capacity. As oil prices continue to rise this additional incentive could be of great use in changing public attitudes to renewables and their economic viability.

## **Transport**

Transport was responsible for around 30% of Northern Ireland's CO<sub>2</sub> emissions in 2004, highlighting the need for tailored transport solutions in Northern Ireland. In the light of widespread concern about the sustainability of biofuels, both in terms of their greenhouse gas savings and their impact on the environment and global food prices, we welcome the strategy's recognition that there may be a need to review the 10 per cent target and the need for robust sustainability criteria for biofuel use. It is unacceptable to continue to promote biofuels which cannot be reasonably shown to offer genuine carbon savings (based on complete life cycle costings) and which do not meet sustainability criteria.

Broadly speaking, we feel that second generation biofuels are the most likely to satisfy sustainability criteria. If possible, biofuels should be produced from the 'waste' of food crops; thus causing less disruption to existing land use, food supply, natural habitats and water availability. Great care must be taken to ensure that increasing demand in the developed world does not cause unacceptable impacts on biodiversity and people in developing countries.

We believe that efficiency improvements in energy systems and reducing demand are more important and offer the greatest potential for greenhouse gas reductions. Efforts to reward the most efficient vehicles, with disincentives for higher carbon travel modes, must be ramped up. Voluntary arrangements to encourage manufacturers to produce more efficient vehicles (based on improving existing technology) are not delivering the expected benefits as the technology is not developing at a rate to compensate for the increasing number of vehicles in use. The use of hydrogen as a fuel may deliver zero emission capability provided the gas is made from a renewable energy source. It is possible to produce hydrogen using electrolysis of water powered by wind turbines and marine current turbines. Vehicles using hydrogen fuel cells to power electric motors are still being developed but will probably be beaten to the mass market by internal combustion engines which burn hydrogen. A good example is the Mazda RX8 rotary engine powered car which can already run on hydrogen with no conversion being required except for the fitting of the hydrogen storage tank. The lack of an affordable refuelling infrastructure is holding deployment back at present and support for this infrastructure is necessary component of the overall strategy.

For hydrogen production, a network of electrolyzers and associated storage tanks would have to be established at existing refuelling stations. Internet based computer systems could control the electrical load demand of the electrolyzers to exactly match the available output from the wind turbines. Therefore, as wind speeds rise and fall, so will gas production rate and resultant pressure in the storage tanks. This means that further deployment of wind turbines can take place as long as an equal capacity of electric vehicle chargers and electrolyzers are added to the system at the same time.

NIEL believes that Northern Ireland's indicative expenditure figures for transport modes need to be revised significantly if we are to move away from a transport system which is dominated by the car. At the moment highway measures have been allocated 80% of the transport spend. Although highway improvements can have positive effects on the other transport modes and the environmental impact of road transport in particular areas (improving local air quality at traffic bottlenecks) they also have the effect of reinforcing Northern Ireland's reliance on cars and trucks. It is generally accepted that the construction of new roads generates more traffic;

therefore, the emphasis for roads should be efficiency rather than capacity. Only by increasing the share of the budget for other transport modes will significant strides be taken towards ending this reliance.

Land use planning plays a particularly important role in shaping individuals' behaviour with regard to travel and transport. It is, therefore, imperative that a coordinated approach be taken when considering land use and transport. A review of the planning system in Northern Ireland is currently being conducted and a revised policy for development in rural areas is expected shortly (it will update the controversial Planning Policy Statement 14). Full implementation of the current PPS 14 should help to increase the sustainability of public transport in more rural areas; by concentrating future development in established settlements planners will provide a more concentrated customer base for public transport operators. Public transport links should be incorporated into new developments, with new bus stops and services provided in growing villages and towns in a proactive and innovative manner.

### **Bioenergy**

The strategy identifies that 30 per cent of the UK's energy needs (excluding transport) could be met from bioenergy, and that the current biomass resource could provide 80-98 per cent of this. This is an ambitious statement and it is essential that sustainability requirements are drawn up, implemented, and monitored effectively to ensure that use of biomass for energy does not impact negatively on the environment.

Bioenergy has the potential to offer positive benefits for woodland, and other habitats and their wildlife. Proper utilisation of bioenergy should reinforce the role of woods in contributing to sustainable development, especially through economic benefits for woodland owners and benefits for local economies. The stimulation of markets for wood products (low grade timber and forest residues, short rotation coppice and short rotation forestry) for production of heat, power, or second generation biofuels could lead to improvements in woodland biodiversity through:

- Restoration of Plantations on Ancient Woodland Sites (PAWS) through removal of conifers
- Bringing woods into sensitive and appropriate management, where it can be demonstrated that this will have biodiversity and/or social benefits
- Expansion of native woodland, and buffering of sensitive woodland: for example, ancient woods could be expanded with low-intensity new planting, including short rotation coppice and forestry
- Renewing public and political appreciation for the value of woodland to society.

There could also lead be additional "ecosystem services" benefits – for instance, replacing traditional arable crops with short rotation coppice could lead to improved soil and water quality because if done correctly it requires lower inputs of fertilisers and pesticides, and planting tree species can help to reduce soil erosion, and mitigate flooding. Even perennial grasses planted for biomass could lead to reduced intensity of land-use, depending on where they are planted, the land-use they replace, and how they are managed.

NIEL has some concerns at the current emphasis on bringing "unmanaged" or "neglected" woods back into active management. Ancient semi-natural woods are a precious and irreplaceable resource, our richest terrestrial wildlife habitat. It should be recognised that where these woods do not have a history of interventionist

management, or where this has lapsed for many years, then introducing a new management regime is not guaranteed to improve biodiversity. In some cases, the increased light levels that would follow from more active management of woods for bioenergy could lead to increased nutrient levels in many woodland soils, which will reduce biodiversity and lead to carbon release<sup>i</sup>.

In Northern Ireland, the forest resource is limited even compared with the rest of the UK: Northern Ireland has the least woodland cover in Europe. Ancient woodland is even scarcer. Woods that have been continuously present since the first comprehensive mapping of the early 19<sup>th</sup> century cover less than one per cent of the land area<sup>ii</sup>. It is therefore essential that the biodiversity of these woods is conserved and enhanced. Careful consideration is required in each case to determine whether or not introducing management for biomass production would be appropriate for these woods.

We would urge that sustainability criteria are introduced, and welcome the suggestion of the Forest Stewardship Council (FSC) certification standard as a model. The UK Forestry Standard also provides a basic level of sustainability for forest operations. However, we would also welcome a strategic approach to utilisation of wood from existing forests, and planting of new trees for fuel, prioritising sources and uses that bring maximum biodiversity gain (for example, through the restoration of Plantations on Ancient Woodland Sites).

We welcome plans for further research into energy crops, particularly if this involves increased consideration of native tree species, since these can also deliver considerable biodiversity and ecosystem services benefits.

Northern Ireland Environment Link, Scottish Environment Link, Wales Environment Link and Wildlife and Countryside Link prepared a policy paper, ***Bioenergy in the UK: Turning Green Promises into Environmental Reality***, which sets out measures that the Links believe need to be taken by national and devolved governments to ensure that UK bioenergy production and use develop in a sustainable way: see [Bioenergy in the UK](#).

### **Innovation**

Investment in Northern Ireland's infrastructure is set to reach unprecedented levels in the next 10 years: with £16 billion expected to be spent by 2016 via the Investment Strategy alone. The decisions made now on funding priorities and on which technologies to back will have a significant impact on the Northern Ireland economy's ability to adapt to and compete in a changed and low carbon world.

We do not believe there is a single technology that will act as a panacea, in fact we are sure that technology alone will not solve our problems. However, we support technology development and acknowledge that tough decisions will have to be made. Northern Ireland is in many ways an untapped resource of renewable energy. Tidal energy holds significant potential for Northern Ireland while off-shore wind and wave may also contribute considerably to our energy mix. There is also potential for the further use of geothermal energy and CCS could also be developed as a temporary fix in Northern Ireland (however, it must be noted that most experts feel that CCS will not be 'market-ready' until 2030: without this technology new coal-fired stations must not be approved. Microgeneration technologies must also continue to be developed. A major challenge must be faced if the 'grid' is to adapt to the different requirements of the 21<sup>st</sup> Century and the pace of technology development in the transport sector must accelerate. We must acknowledge the severity of the problem and carry out sensitive and thorough environmental assessments of all proposed projects so that

they can be implemented with minimal collateral impact on people, wildlife or the landscape.

It is essential that a wide range of renewable energy technologies are developed and deployed; we should not make the mistake of concentrating on any one technological solution as a panacea. On the contrary, a wide range of solutions need to be explored and deployed to determine those which are best and to maintain a broad base of different sources; no one source is appropriate for all applications.

### **Business Benefits**

The move to indigenous renewable fuels may also help address our energy security concerns and develop industries that will provide economic opportunity and jobs locally. The renewable sector in Germany supports 170,000 people and existing German government support measures promoting renewable energy could create 130,000 new jobs by 2020, according to the German environment ministry; the current figure for the UK is only 25,000 with a small percentage of these jobs in Northern Ireland.

Northern Ireland has huge potential for developing and exploiting renewable resources, a manufacturing tradition, a skilled workforce and a need to develop new infrastructure. The scale of the opportunities offered by a low carbon economy were illustrated, for example, by the 1999 analysis by Greenpeace which showed how over 30,000 new jobs could be created in the UK if the Government committed to a target of 10% of electricity from offshore wind in the next 10 years. In a recent speech, the Prime Minister stated that the overall added value of the low carbon energy sector by 2050 could be as high as \$3 trillion per year worldwide and that it could employ more than 25 million people. Given the huge potential that exists around our shores for wind power there are sound economic and environmental reasons for ensuring that a significant proportion of these jobs are developed here.

### **Wider impacts**

In the absence of a comprehensive international agreement on carbon trading, purchasing any significant quantity of carbon credits from jurisdictions where there is not a robust cap on emissions is a dangerous strategy that will not prevent catastrophic climate change in Northern Ireland and around the world. It is therefore incumbent on the UK as the innovator of climate change legislation to ensure that the integrity of the UK's efforts is upheld and that the purchase of credits is severely restricted. While we support technology transfer and investment in adaptation and mitigation measures in developing nations, these must not be seen as an alternative to mitigation measures in the developed world. We believe that any carbon credits/offsetting must have clearly demonstrable sustainability credentials and represent new and additional projects. We would advocate only the use of 'Gold Standard' credits. We also believe that there should be a form of dual reporting of emissions net of trading and gross of trading as there is concern that over reliance on buying imported credits, which may appear cheaper in the short term, may lock the UK in to high carbon investments and infrastructure which may take many decades to reverse. Such investments may impose very significant costs on the UK economy in the future once more stringent emissions targets bite.

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<sup>i</sup> Kirby, K.J, Smart, S.M., Black, H.I.J, Bunce, R.G.H., Corney, P.M., Smithers, R.J. (2005), *Long-term ecological changes in British woodland (1971-2001)*, English Nature Research Report Number 653, English Nature, Peterborough, pp.112-116

<sup>ii</sup> Woodland Trust (2007) *Back on the map: an inventory of ancient and long-established woodland for Northern Ireland*