The need to consider geoengineering techniques using peatlands

Christian Dunn
Wolfson Carbon Capture Laboratory, School of Biological Sciences, Bangor University, Gwynedd, UK. LL57 2UW.
Tel: +44 (0) 1248 351151
Email: c.dunn@bangor.ac.uk

The co-founder of the Nobel Prize-winning IPCC, Sir John Houghton, claims global warming represents the "single greatest threat mankind has ever faced" (Houghton, 2010). Such assertions suggest it is the obligation of world leaders and scientists to help safeguard the lives of the planet's seven billion people. Any "war on climate change" may mean making decisions and implementing actions which would be unnecessary and even un-palatable in "peace-time".

As it is widely accepted that anthropogenic increases in the production of greenhouse gas (GHG) emissions are the major contributing factor to current global warming, the obvious and, arguably, most important action should be a drastic rethink in our consumption and use of the world's resources (IPCC, 2007). However, it is feared that emissions will not be reduced at the rate or magnitude required to prevent some of the more apocalyptic climate predictions from becoming reality (Royal Society, 2009). Something must therefore be done now to reduce the amounts of GHGs in our atmosphere.

In a lecture last year Professor Chris Freeman suggested several geoengineering techniques to harness and improve the carbon sequestering characteristics of peatlands as a way of removing significant amounts of these excess GHGs (Freeman, 2011). Indeed, by increasing the concentrations of phenolics in peat soils Freeman predicts an extra 1.7x1015 g yr-1 of carbon can be sequestered - equivalent to around one-and-a-half times the current emissions produced by transport. Methods to do this include storing phenolic material in the peatlands themselves and using genetically modified Sphagnum species to amplify phenol production. Like all geoengineering techniques, because of the expense and any potential unforeseen consequences, the hope is they will never need to be used on a large scale due to a global census to reduce GHG emissions. However, a detailed report by the Royal Society (2009) concluded that further research into "low risk" geoengineering methods should be undertaken in case their

implementation is needed within this century. This should include "carefully planned and executed experiments". Using the criteria laid out by the Royal Society the techniques suggested by Freeman are likely to fall into the "low risk" geoengineering category; they are also likely to be cheaper and more cost effective than techniques such as space reflectors and mechanical carbon dioxide removers.

Responding to the ideas in Freeman's lecture, Runkle (2012) gave a well-argued call for caution in the use of peatland geoengineering techniques. I wholeheartedly agree with many of the issues raised in Runkle's discussion, in this publication. However, subtle modifications of peatland ecosystems and use of only restored peatlands for carbon sequestration projects (as Runkle suggests) may not remove the significant amounts of carbon from the atmosphere that could otherwise be achieved. Clearly this is only an issue if we accept some of the more dire of global warming predictions, but can we afford not to take these threats seriously and at least start to investigate all preventative avenues? As Runkle points out, the history of ecological interventions is littered with unintended consequences and any research into geoengineering techniques must do all it can to prevent falling into this trap too. It has even been mooted geoengineers should sign a form of Hippocratic oath before undertaking research because of the potential for widespread harm (Lovelock, 2008).

As an admirer of our planet's unique peatland ecosystems, do I want to do anything that could damage them? No; but the debate on whether we should use peatlands in geoengineering presents a serious moral dilemma which the wetland and biogeochemistry community must answer: *should we leave our pristine peatlands untouched, while average global temperatures continue to rise, if they have the potential to significantly reduce GHGs levels*? I acknowledge that we must ensure our most important peatlands continue to be protected and conserved to some level, but it is essential to realise we may have the ability to prevent the catastrophic effects of climate change that have been predicted. So should we stand by and wait for unprecedented political change or another area of science to come to the rescue? I would argue not. We as wetland scientist have a duty to care for our valuable peatland environments, but we also have a duty to formulate a "Plan B" for the planet, that could be put in place quickly and effectively should the need ever arise.

Acknowledgements

The author is supported by the knowledge and Economy Skills Scholarship, which is part funded by the European Social Fund through the European Union's Convergence programme administered by the Welsh Assembly Government, and George Meyrick of Energy and Environment Business Services.

References

FREEMAN, C. 2011. Peatland carbon sequestration: some future options. Plenary lecture at the 2011 joint meeting of the Society of Wetland Scientists, WETPOL and Wetland Biogeochemistry Symposium. Prague, Czech Republic.

HOUGHTON, J. 2010. Opening speech for the Wolfson Carbon Capture Laboratory at Bangor University, UK.

IPCC (ed.) 2007. Climate Change 2007: *Impacts, Adaptation and Vulnerability*. : Cambridge University Press, Cambridge.

LOVELOCK, J. 2008. A geophysiologist's thoughts on geoengineering. *Philosophical Transactions of the Royal Society a-Mathematical Physical and Engineering Sciences*, 366, 3883-3890.

ROYAL SOCIETY 2009. Geoengineering the climate. Science, governance and uncertainty. London: The Royal Society.

RUNKLE, B. 2011. Reasons for precaution in ecologically engineering peatland-based carbon sequestration. *Wetland Science and Practice*, 28, 10-16.