Peatlands and the climate challenge in the UK

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Investing in Peatlands – the Climate Challenge, University of Durham, 28-29th Sept. 2010
Global SOC stocks

- 1500 Pg C to 1 m (2 x atmospheric C, 3 x vegetation C)
- >2000 Pg C in total
- ~500 Pg in peatlands
- ~1/4 of total global soil C

Smith (2004)
Global SOC stocks

USDA (2010)
Global importance of peatlands

- 1990’s C emissions ~ 8 Pg C per year
- 1990’s annual increase in atmospheric $C = 3.2 \pm 0.1$ Pg per year
- ~500 Pg in peatlands
- So loss of 1.6% of peatland C = total annual human C emissions
- Or loss of 0.6% of peatland C = total annual increase in atmospheric $CO_2-C$

Smith (2004)
Peatlands – the UK’s biggest Carbon store

UK soils: $9838 \pm 2463$ Mt C in soils
(compare to 114 Mt C in vegetation; Dawson & Smith, 2009; Bradley et al., 2005)

Of this, nearly $\frac{1}{2}$ is held in Scottish peatlands, but other important peatlands throughout the UK (Bradley et al., 2005)
Importance of peatlands in UK

• 2007 UK GHG emissions: 635 Mt CO$_2$-eq. / yr = 170 Mt C / yr (CCC, 2010)
• UK LULUCF emissions: -2 Mt CO$_2$-eq. / yr = 0.5 Mt C / yr (Dyson et al., 2009)
• To 1m, UK peats contain: 1357 Mt C (Bradley et al., 2005)
• So loss of 12% of UK peatland C = total annual UK human GHG emissions
• Or loss of 0.04% of UK peatland C would wipe out the current UK LULUCF sink

Smith et al. (2010)
Peatlands - take home messages

• Extremely important in the global C cycle and in the UK GHG budget
• C cycle and UK GHG budget extremely sensitive to changes in peatland C emissions
• Peatlands themselves very sensitive to climate change / (mis-)management
Climate threats to peatlands

- Increased temperature (speeds decomposition)
- Decreased rainfall (peatlands depend on wet conditions)
- Change in vegetation structure due to climate change - indirect impact on peatlands
- Threat of pressure on land as climate suitability for agriculture moves north
Will peatlands still be able to exist under future climates?

<table>
<thead>
<tr>
<th>UKCIP02 High Emissions Scenario</th>
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<tr>
<td>(a) 1961-90</td>
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<td>(b) 2020s</td>
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<td>(c) 2050s</td>
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<td>(d) 2080s</td>
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See the talk of Jo Clarke et al.
Need to measure and monitor

e.g. Billett et al. (2010) - see also Chris Robinson on MICCI
Threats & Opportunities

• Land management interventions (burning, grazing, liming, drainage, land-use change) plus other drivers (e.g. acid deposition)

• Potential restoration practices (grip blocking, grazing and fire regime management)

• Aims for restoration:
  - Reduce ongoing emissions from damaged peatlands
  - Sequester carbon
  - Improve resilience to future climate change
  - Reduce vulnerability to other pressures

See the talk of Fred Worrall et al., and other presenters
Mitigation potential of peatlands

Smith et al. (2007; 2008)

Tiny area - massive per-area potential
Identifying the opportunities

• Are there win-win opportunities (improve resilience and reduce emissions) in peatlands in terms of climate change?

• Are there win-win-win opportunities in peatlands in terms of delivering other ecosystem services?