Conservation in the wider context of climate change mitigation and adaptation

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LWEC Director
11 January 2011
Biodiversity under threat

Percentage coral cover

Proportion of rugosity values <1.5

Source: Gardner et al 2003; Alvarez et al 2009
Human activities have increased dramatically over the last century.
Biodiversity conservation

Indirect drivers:
- Economic
- Demographic
- Socio-political
- Cultural & religious
- Science & Technology

Direct drivers:
- Habitat Change
- Climate Change
- Invasive Species
- Over-exploitation
- Nutrients & pollution

Biodiversity Loss
Climate, demography and economy

GHG = Population x GDP per person x Emissions per GDP

\[ GHG = \text{POP} \left( \frac{\text{GDP}}{\text{POP}} \right) \left( \frac{\text{GHG}}{\text{GDP}} \right) \]

- GHG/GJ: Energy intensity
- Carbon intensity: GJ/GDP
Fossil fuel emissions

- Global CO$_2$ emissions from fossil fuel burning decreased by 1.3% in 2009
- Emissions are projected to increase by more than 3% in 2010, approaching the high growth rates of 2000 to 2008
- Growth in emissions closely follows growth in GDP

<table>
<thead>
<tr>
<th>Country</th>
<th>2009 Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>-6.9%</td>
</tr>
<tr>
<td>UK</td>
<td>-8.6%</td>
</tr>
<tr>
<td>Germany</td>
<td>-7%</td>
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<tr>
<td>Japan</td>
<td>-11.8%</td>
</tr>
<tr>
<td>Russia</td>
<td>-8.4%</td>
</tr>
<tr>
<td>China</td>
<td>+8%</td>
</tr>
<tr>
<td>India</td>
<td>+6.2%</td>
</tr>
<tr>
<td>South Korea</td>
<td>+1.4%</td>
</tr>
</tbody>
</table>

Friedlingstein et al 2010
Climate mitigation

Aim for 2 °C and Plan for 4 °C
or
Aim for 4 °C and Plan for 2 °C

Source: Friedlinstein et al 2010
Source: Kevin Anderson
Projected impacts

Source: Parry et al 2008
Foresight, knowledge and tools

To ensure people continue to derive benefits from ecosystems and live with environmental change we need

- **Foresight** of future environmental conditions
- **Innovation** and an enhanced ability to make best use of existing **knowledge**
- **Tools** and technologies for those who have responsibilities and duties for managing environmental resources or regulating their use
Aims to ensure that decision makers in government, business and society have the knowledge, foresight and tools to mitigate, adapt to and benefit from environmental change.
Foresight and uncertainty

- Scientific and social uncertainty
  - Limited potential for reducing either
- Reasonably confident about some uncertainties
  - Monotonic changes in global average temperatures and declining ocean pHs
- Uncertainty is much greater in other areas
  - Precipitation, storminess, local climate, tipping points
- Not all uncertainties are equally problematic in decision making
Horizon scanning

Horizon scan of global conservation issues for 2011

William J. Sutherland¹, Sarah Bardsley², Leon Bennun³, Mick Clout⁴, Isabelle M. Côté⁵, Michael H. Depledge⁶, Lynn V. Dicks¹, Andrew P. Dobson⁷, Liz Fellman⁸, Erica Fleishman⁹, David W. Gibbons¹⁰, Andrew J. Impey¹¹, John H. Lawton¹¹, Fiona Lickorish¹², David B. Lindenmayer¹³, Thomas E. Lovejoy¹⁴, Ralph Mac Nally¹⁵, Jane Madgwick¹⁶, Lloyd S. Peck¹⁷, Jules Pretty¹⁸, Stephanie V. Prior¹, Kent H. Redford¹⁹, Jörn P.W. Scharlemann²⁰, Mark Spalding²¹, and Andrew R. Watkinson²²

- Environmental consequences of increasing milk consumption in Asia
- New greenhouse gases
- Increases in productivity of polar oceans driven by loss of sea ice
- Expansion in mining for lithium used in rechargeable batteries
- Biological impacts of perfluorinated compounds
- Denial of biodiversity loss

Source: Sutherland et al 2011
Knowledge and knowledge exchange

1. Innovative research

2. Interdisciplinarity and Integrated Assessment

3. Constructing the evidence base

4. Solutions research

5. Strong knowledge exchange
Knowledge gaps

- Resources
- Systems
- Ecosystems

Smart et al 2010 (Countryside Survey)
The ecosystem approach

- Biodiversity and Ecosystem Service Sustainability (BESS)
- National Ecosystem Assessment
- Carbon flux from peatlands
- Ocean acidification
- Ecosystem Services for Poverty Alleviation (ESPA)
- Insect Pollinator Initiative
- Macronutrient Cycles
- Valuation network
Decision making tools

1. Identify problem and objectives
2. Establish decision-making criteria
3. Assess Risk
4. Identify Options
5. Appraise Options
6. Make Decision
7. Implement Decision
8. Monitor

The adaptation process

- To reduce exposure to the risk of damage
- To develop the capacity to cope with unavoidable damages
- To take advantage of new opportunities

Ranger et al 2009
Adaptive risk management

Risk management involves identifying the hazard (the probability of an event) and some measure of its consequence or impact.

Foresight flood risk

Source: Evans et al. 2004
Types of decisions

• Need to take account of life time of decisions
  – Short lead and short consequence (planting cultivars)
  – Short lead time and long consequence (watering hole)
  – Long lead time and short consequence (new cultivar)
  – Long lead time and long consequence (new town)

• Incremental and transformational decisions
  – Incremental decisions enable decision-maker to continue to meet current objectives under changed conditions (e.g. Changing cultivars to continue farming)
  – Transformative decisions require fundamental change in objectives (e.g. Land use change)
Are we making the right decisions?

- Adaptation is currently generally viewed as the means of continuing what we are doing
- Concerned with climate proofing existing practices in which the objectives remain unchanged
- The need for continuous and transformational change is largely unaddressed
- We are aiming for 4°C and planning for 2 °C
- There is a real danger of maladaptation
  - What is appropriate for a 2 °C may be inappropriate (and costly) for a 4 °C world
  - Incremental adaptation may prevent more transformative measures
Robust adaptation

Max water level rise:

- 0m: Defra
- 1m: Improve Thames Barrier and raise d/s defences
- 2m: Over-rotate Thames Barrier and restore interim defences
- 2m: Flood storage, over rotate Thames Barrier, raise w/s & d/s defences
- 3m: Flood storage, improve Thames Barrier, raise w/s & d/s defences
- 4m: New barrier, retain Thames Barrier, raise defences
- 4m: New barrier, raise defences

Environment Agency

[Image of map and river]

[Image of Thames Barrier]

[Image of flood risk areas]
The governance of change

Plan for the longer term within risk framework

Join up thinking: integrated management

Risk management plans

Linking and co-ordination of planning processes

Legislation, regulation and enforcement

Support networks

Finance

Meeting the challenge of environmental change

Incentivise management of ecosystem goods and services (e.g. C trading)

After Tompkins et al 2005
Conclusions

1. Climate change is only one of a range of related environmental change issues
2. The mitigation agenda has put land use firmly at the centre of the agenda
3. Adaptation requires a systems perspective
4. Responding to environmental change requires foresight, knowledge, tools and action
5. Adapting to 4°C will require more substantial and transformative processes than adaptation to 2°C