

Insights from Behavioural Economics for Global Sustainability

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The research agency of government departments responsible for forestry in Britain

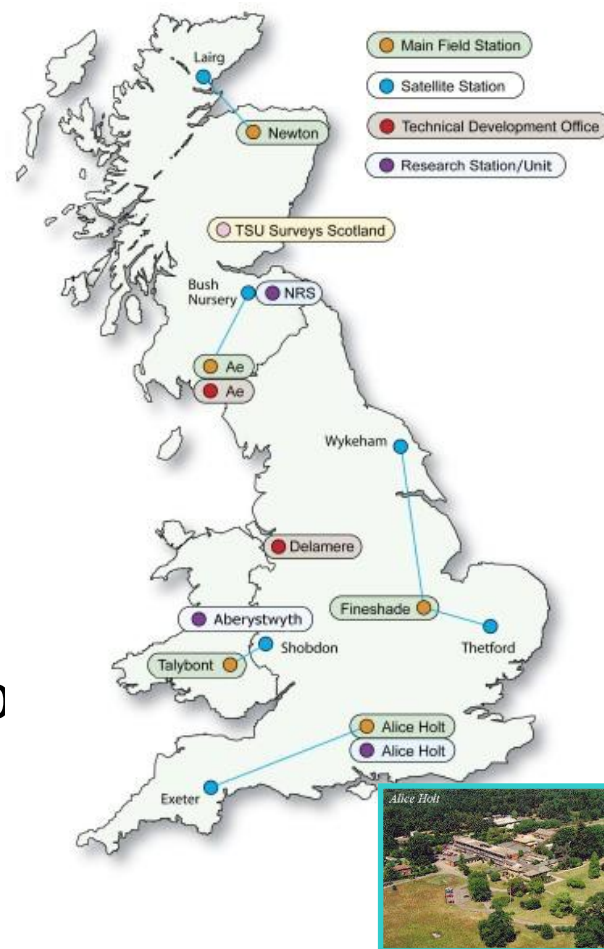
• Realising the Economic Value of Ecosystem Services (REVES):

- Payments for Ecosystem services
- Ecosystem services valuation
 - Behavioural economics
 - Natural capital accounting

Climate change mitigation & adaptatio

- cost-effectiveness of forestry options
- optimal rotation length & increasing wind risk

Locations



Introduction

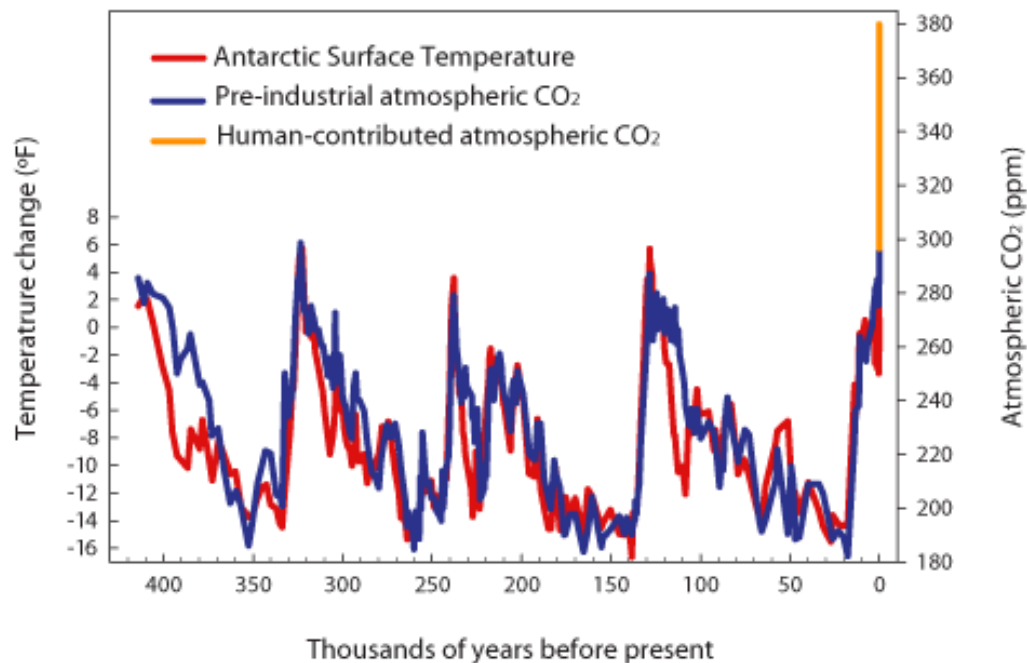
Behavioural Economics Insights

- **Valuing** ecosystem services & sustainability
- Policy '**nudges**' to meet climate change goals
- **International Environmental Agreements**

Concluding remarks

Trends in Atmospheric CO₂ & Global Surface Temperature

The last 400,000 Years



Data Sources:

Atmospheric CO₂ prior to 3000 years ago and Antarctic Surface temperature prior to 100 years ago: J.R. Petit, Jouzel J., et al. 1999. Climate and atmospheric history of the past 420,000 years from the Vostok ice core, Antarctica. *Nature* 399:429-436.

Pre-industrial CO₂ 40-3000 years ago: Indermühle A., T.F. Stocker, F., et. al. 1999. Holocene carbon-cycle dynamics based on CO₂ trapped in ice at Taylor Dome, Antarctica. *Nature* 398, 121-126.

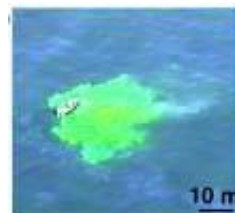
Modern CO₂: Keeling, C.D. and T.P. Whorf. 2005. Atmospheric CO₂ records from sites in the SIO air sampling network. In *Trends: A Compendium of Data on Global Change*. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A.

Atmospheric CO₂
concentration **> 395 ppm**
compared to pre-industrial
level ~ 280 ppm
& rising at **2 ppm/yr**

**Scientific
consensus:**

'BAU' most likely to
lead to a **rise of at
least 4°C** above the
pre-industrial global
mean **by end of the
century** (IPCC, 2014)

?° Risk of large changes in ocean circulation, and the release of methane clathrates.



3° Risk of significant loss of Amazon rainforest.
Globally few ecosystems can adapt, consequent reductions in food supply and consequent further damage to the climate system.



2° Melting of Greenland ice sheet may become irreversible.



1° Some marine ecosystems suffer irreversible change.

Ocean acidification is already a risk.



Source: Vicky Pope, Met Office Hadley Centre © Crown copyright 2007

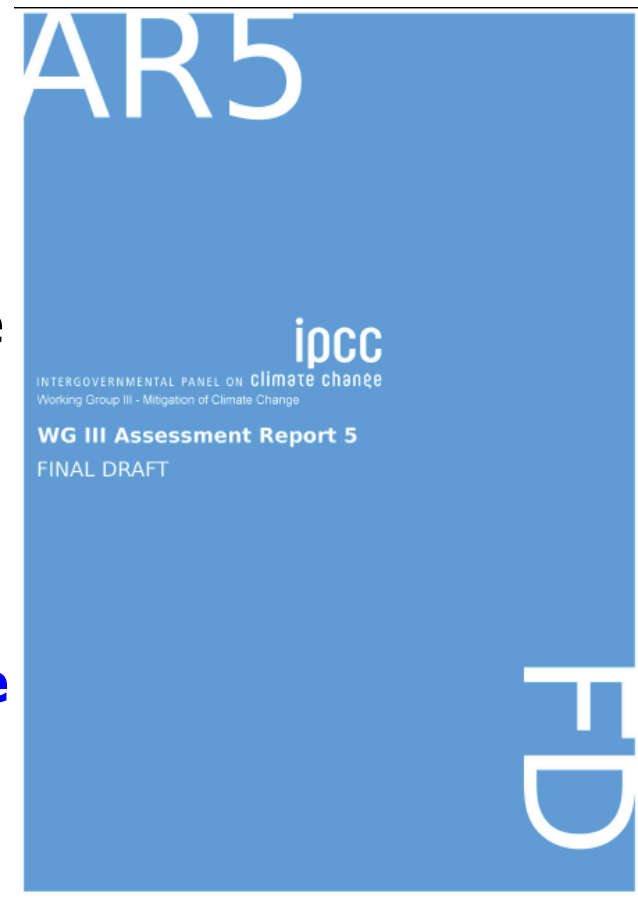
Economic Behaviour:

- **often not well predicted in practice by conventional economic 'rationality'** (*homo economicus*) **based on:**
 - self-interested
 - stable preferences
 - unlimited computational power
 - probabilities about the likelihood of all potential outcomes.
 - maximizing utility (satisfaction of preferences) subject to budget constraints and probabilities of different states of the world.
- **Experiments** consistently **demonstrate:**
 - inconsistent choices (e.g. due to '**cognitive biases**')
 - choices dependent upon **framing** effects etc

“people’s beliefs about the implications of different choices may be **systematically biased**.”

- “When making decisions, **people** tend to overweight outcomes that are especially ‘available’ or salient... They are **more averse to losses than** they are **interested in gains** relative to a reference point ...Because climate change involves a loss of existing environmental amenities, this can increase its perceived costs. However, **if the costs of abatement are seen as a reduction relative to a reference rate of future economic growth, this can increase the perceived costs of climate change mitigation.**”

IPCC (2014, WGIII, Ch.3, final draft, p.65, pp.67-68).





Research Report

Insights from behavioural
economics for ecosystem services
valuation and sustainability

How do cognitive factors affect values?

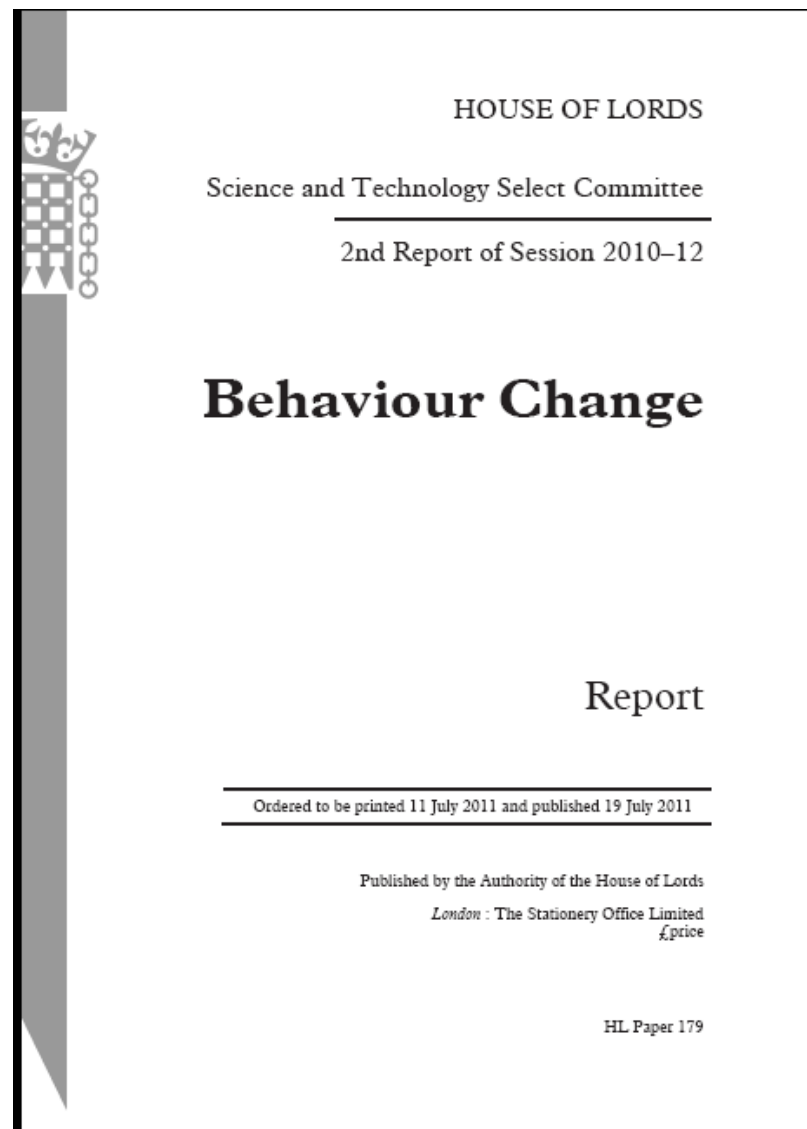
- **Information processing** (bounded rationality, mental accounting...)
- **Information presentation** (format, framing...)
- **Context** (setting, anchoring, hypothetical bias ...)
- **Learning**
- **Loss aversion**
- **Lexicographic preferences**

Influence of Cognitive factors on ecosystem service values:

Aspect	Focus	Impact on stated values		Key references
		Level	Variance	
Format	Textual compared to tabular information	2.5 to 4 times higher	2 times higher	Hoehn et al (2010)
Framing	1) Structural (species groups) compared to functional (water levels) description 2) Named species compared to a group of 5 unnamed species 3) Label effect	2 times higher 1.7 to 1.8 times higher marginal rate of substitution 1.3 times higher when 'National Park' label used		Milon & Scrogin (2006) Jacobsen et al (2008) Czajkowski & Hanley (2009)

“Many of the goals to which governments aspire—such as... meeting targets for carbon emissions—can be achieved only if people change their behaviour.

...understanding how to change the behaviour of populations should be a concern for any government if it is to be successful.” (House of Lords p.7)



UK Behavioural Insights Team ('Nudge Unit'):

- **applies insights from behavioural economics to public policy & services**

- **initially established as part of the UK Cabinet Office**

- now a partly Government-owned company

<https://www.gov.uk/government/organisations/behavioural-insights-team>

Behaviour Change
and Energy Use

How might 'nudges' be applied to encourage climate change mitigation & adaptation?

Nudges: ways of influencing people's choices without limiting options, or appreciably altering their relative costs

How Cost-Effective Is Forestry for Climate Change Mitigation?

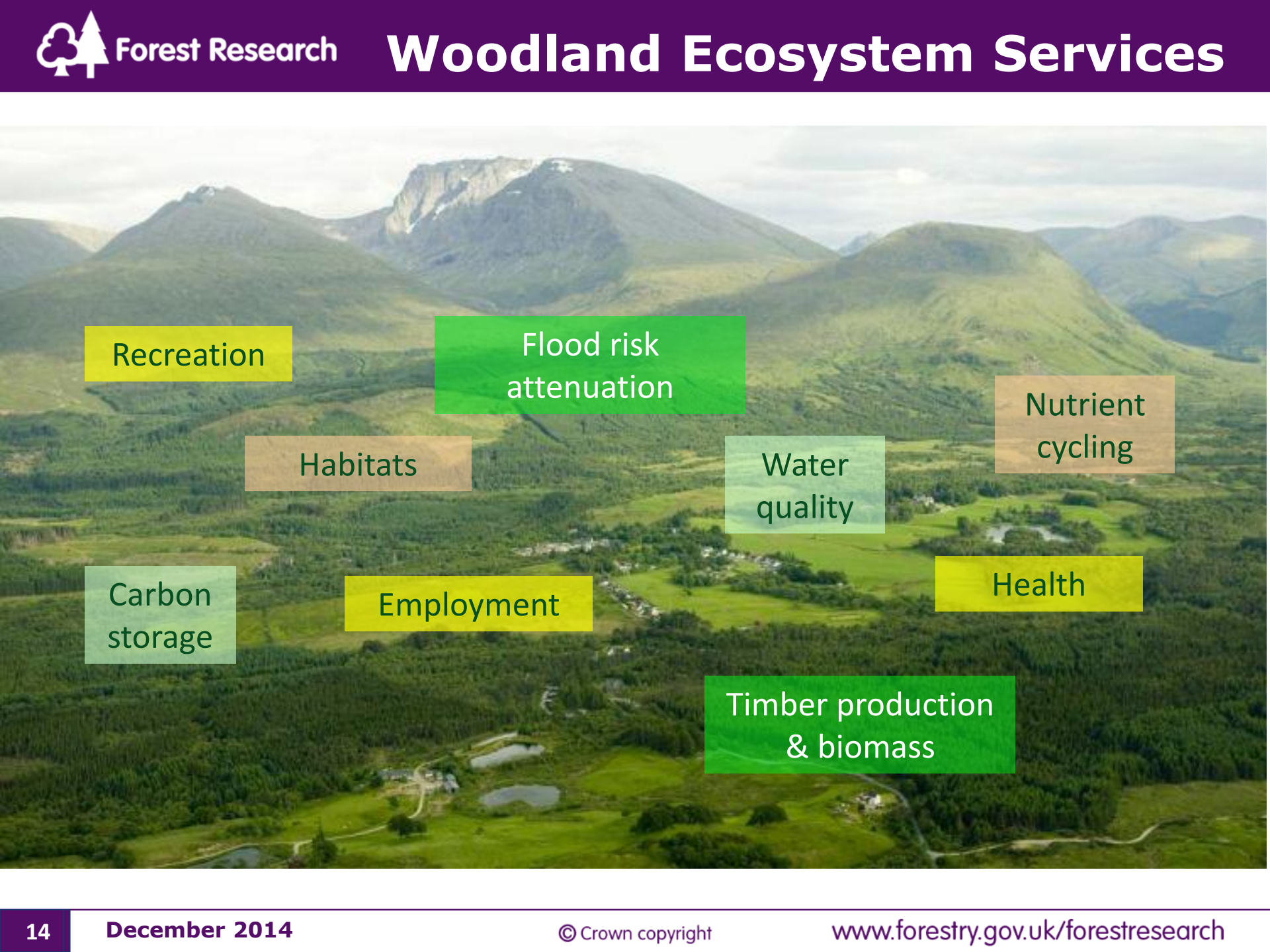
Gregory Valatin and Colin Price



	Regulation of the individual		Fiscal measures directed at the individual	Non-regulatory and non-fiscal measures with relation to the individual						
					Choice Architecture (“Nudges”)					
Interventions category	Eliminate choice	Restrict choice	Guide and enable choice							
			Fiscal disincentives	Fiscal incentives	Non-fiscal incentives and disincentives	Persuasion	Provision of information	Changes to physical environment	Changes to the default policy	Use of social norms and salience
Examples of policy interventions	Prohibiting goods or services e.g. banning certain drugs	Restricting the options available to individuals e.g. outlawing smoking in public places	Fiscal policies to make behaviours more costly e.g. taxation on cigarettes or congestion charging in towns and cities	Fiscal policies to make behaviours financially beneficial e.g. tax breaks on the purchase of bicycles or paying individuals to recycle	Policies which reward or penalise certain behaviours e.g. time off work to volunteer	Persuading individuals using argument e.g. GPs persuading people to drink less, counselling services or marketing campaigns	Providing information in e.g. leaflets showing the carbon usage of household appliances *Regulation to require businesses to use front of pack nutritional labelling, or restaurants to provide calorific information on menus	Altering the environment e.g. traffic calming measures or designing buildings with fewer lifts *Regulation to require businesses to remove confectionery from checkouts, or the restriction of advertising of unhealthy products	Changing the default option e.g. requiring people to opt out of rather than opt in to organ donation or providing salad as the default side dish	Providing information about what others are doing e.g. information about an individual's energy usage compared to the rest of the street *Regulation to require energy companies to provide information about average usage

Note: * Demonstrates how regulation of businesses might be used to guide the choice of individuals, thus distinguishing it from regulation which restricts or eliminates the choice of individual.

Source: **House of Lords (2011, p.10)**



Recreation

Flood risk
attenuation

Nutrient
cycling

Habitats

Water
quality

Carbon
storage

Employment

Health

Timber production
& biomass

Farmers (F)

- A diverse group; often relatively cash-poor and responsive to woodland creation grants and short-term income opportunities (woodfuel, etc)
- Future timber revenues often little incentive for planting

Estate managers/owners (E)

- Privately owned estates, NGOs and public agencies
- Often greater access to capital and able to cross-subsidise forestry
- Can manage for longer-term and wider objectives (incl. non-market benefits)



Inward investors (I)

- Cash rich institutional investors (e.g. pension funds and multinationals)
- Purchase whole estates; plant conifers solely to maximise long-term profits
- Grants are not important in decision making

Socially responsible investors (or impact investors) (S)

- A small but growing category, similar to 'inward investors'
- Benefit from publicising the public benefits of woodland creation, e.g. in Corporate Social Responsibility (CSR) statements.

Behavioural insight	Potential application	Type of owner/ manager / investor
Prompted choices	Individuals asked to make a choice about woodland creation (for climate change mitigation) or about woodland management (for climate change adaptation) when applying for public grants	F, E
Format	Make information clearer and easier, highlighting key messages; pre-populating application forms	F, E, I, S
Remove friction	Identify 'sticking points' in bureaucratic and operational procedures of woodland creation and climate change adaptation, and offer a service to deal with them	F, E, I, S
Affect	Use strong feelings to prompt decisions, e.g. by highlighting regions or businesses with a high carbon footprint and negative environmental effects (and opportunities offered by woodland)	F, E, S
Social norms	Tell land managers about the 'pro-social' behaviour of their neighbours and peers who are planting woodland or adapting the management of existing woodlands	F, E, S
Networks	Use social networks to encourage collective behaviour, e.g. by increasing grant rates once a threshold level of woodland creation has been achieved in a locality	F, E
Commitment	Encourage public commitments to create woodland for climate change mitigation and to adapt existing woodlands to climate change (and then publish pledges on websites)	S
Priming	Prime target audiences with success stories and demonstration sites	F, E, I, S
Mental accounts	Promote options as part of an integrated approach to land management that allows people to assign woodland creation to a different mental account, e.g. a source of carbon benefits	F, E
Exemplify	Respond to individuals' desires for reciprocity and fairness by encouraging woodland creation and adaptation to climate change through example and by public commitments	F, E, S
Key moments	Consider timing interventions around critical points, e.g. following media coverage of climate change, or at key life stages when land managers are open to change (e.g. inheritance)	F, E, S

F = Farmer; E = Estate owners/managers; I = Inward investors; S = Socially responsible investors

Can International Environmental Agreements (IEAs) negotiated by governments make a significant difference?

- Early game theory results suggested:
 - **a self-enforcing IEA may not exist** (Barrett 1994)
 - where one exists, it is **unlikely to** be signed by more than a few countries (Barrett 1997; Carraro and Siniscalco 2001), or **significantly improve upon the non-cooperative equilibrium** (Barrett 1997; Carraro ed. 2003)

Re-framing the problem as an environmental security issue:

- **a self-enforcing IEA exists**
- the IEA **can secure the global sustainability (e.g. 2°C) goal**
 - **significantly improves upon the non-cooperative equilibrium**



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JUSTICE, HUMAN SECURITY AND
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Economics PhD Thesis
2005

PROPOSITION: *A self-enforcing IEA to prevent dangerous climate change exists providing the net benefits of cooperation for each signatory if a grand coalition forms are non-negative. A self-enforcing IEA consists of the minimum number of signatories to satisfy the participation constraint of each*



Modified assumptions:

1) global abatement target agreed based upon a shared conception of what is required to avoid 'dangerous' climate change (e.g. consistent with 2° C target).

- target is independent of the number of countries joining
- target **technically feasible**.

2) burden-sharing rule agreed

• If some parties withdraw after an agreement is signed, the amount of abatement undertaken by each remaining signatory increases correspondingly in order to meet the global abatement target.

- This occurs providing each signatory is better off than in the absence of an agreement (i.e. the participation constraint of each is satisfied). If the number of signatories falls such that the remaining signatories are no longer better off, the agreement is assumed to collapse.



Behavioural economics insights:

- few explicit applications to global sustainability issues**

“Achieving any progress on intractable global environmental issues such as climate and biodiversity change will require **changes in behavior and social norms** ...a persistent “gap” between science and policy remains” (Kinzig et al, 2013, p.14)



‘lead by example’ nudges in negotiations on international environmental issues common?



E.g. **‘US and China's climate change agreement prompts calls for Australia to follow suit’**

[Australian Broadcasting Corporation, Nov 13th 2014:
<http://www.abc.net.au/news/2014-11-13/calls-for-australia-to-reduce-emissions-after-us-china-deal/5887474>]

Information dissemination key if popular misconceptions, optimism bias & fatalistic attitudes affecting willingness to undertake mitigation activities are to be overcome



- **One of the most useful roles of behavioural economics in climate policy is addressing perceptions of the cost of climate policy** (Anderson, 2012, p.22).

Framing:

- focus more on possibilities & opportunities than risks & problems to help motivate action?



"Sometimes facing up to the truth is just too hard. When the facts are distressing it is easier to reframe or ignore them. Around the world only a few have truly faced up to the facts about global warming."

Hamilton (2010). Requiem for a species, p.x.

“If we do nothing, we will be hit by devastating impacts...The future is almost beyond what we can imagine, what we have ever seen before. Therefore, our role now is to **think differently, to achieve greater clarity, to **foster a greater imagination** and to **no longer keep saying that it is impossible**. We must make the impossible possible.”**



(Anderson, 2012, p.39)

- Thanks to colleagues at Forest Research who contributed to studies on insights from behavioural economics – **Darren Moseley**, Norman Dandy and Dave Edwards.



- *Thanks also to the University of Siena for providing a scholarship that facilitated my initial exploration of the economics of international environmental agreements.*