

Institution: The University of Edinburgh
Unit of Assessment: B7 – Earth Systems and Environmental Sciences
Title of case study: PUBLIC ENGAGEMENT AND POLICY FORMATION RELATED TO CLIMATE CHANGE MITIGATION BY INDIVIDUALS
<p>1. Summary of the impact</p> <p>Impacts: I) Enhanced public engagement with, and understanding of, climate mitigation by individuals, delivered through two successful popular science publications and sustained bodies of media and outreach work. II) Public policy formation related to climate change mitigation.</p> <p>Significance and reach: Impacts of the popular science books include >5,500 sales of a children's book (2009 - 2011) and documented household-level behaviour changes in energy usage. The European Commission issued new directives on energy saving appliances in December 2008.</p> <p>Underpinned by: Research into the role of individuals in climate change mitigation, undertaken at the University of Edinburgh (2001 onwards).</p>
<p>2. Underpinning research</p> <p>Numbered references refer to research outputs in Section 3.</p> <p>Key researchers</p> <p>The start and end dates of continuous employment in the School of GeoSciences, University of Edinburgh, are shown along with the most recent / current position of each researcher.</p> <p>Reay, Reader in Carbon Management (2001 onwards) Grace, Professor (1970 – 2010; 2013 onwards)</p> <p>Research overview and context</p> <p>Research led by Reay at the University of Edinburgh (2001 onwards) has investigated the climate change mitigation potentials of individuals, both as a function of differing lifestyles and within specific sectors. This work builds upon pre-2001 research by Reay that documented the potential for greenhouse gas (GHG) emission reductions at the household level equivalent to that aimed at by all Annex 1 nations within the UNFCCC's Kyoto Protocol (5% by 2008-2012 on a 1990 baseline). This foundational work demonstrated that such a reduction was relatively straightforward for the average developed-world household, with emissions reductions in the energy use and transport sectors being especially significant and attractive.</p> <p>Key research findings that underpin the subsequent impact</p> <p>An influential study by Reay, published in 2002, assessed the climate change mitigation potential and financial costs/benefits of 'climate aware' and 'climate ignorant' lifestyles [1]. The study has also gone on to be reproduced in book chapter form in a Royal Society volume [2]. This work established that emission cuts of >80% for the domestic sector were possible via behavioural changes and increased energy efficiency, providing a developed world cut in total emissions from all sectors of approximately 30%. The household-level emission cuts detailed in the research could also be achieved at negative net cost to the individual, with a 'climate aware' lifestyle accruing savings of approximately £80k (net present value) over the course of a lifetime [1,2,3].</p> <p>Reay has also investigated climate change mitigation by individuals in specific sectors, including transport, technology, agriculture and waste. Work co-authored by Reay and Grace in 2006 focussed on the transport sector and the relationship of emissions with household income [4], identifying a strong correlation between income and transport emissions. Co-authored work by Reay has also examined the role of technology in mitigating emissions from the transport sector, identifying the potential of virtual meetings to significantly reduce business travel emissions [2]. In the agriculture sector, Reay was a lead author for the European Nitrogen Assessment (2008-</p>

Impact case study (REF3b)

2011), investigating the potential for, and barriers to, reductions in nitrogen wastage and nitrous oxide emissions through behavioural change [5]. This research identified the need for more stakeholder-specific policy and public communication in order to engender behavioural change. Associated work by Reay has addressed climate change mitigation through dietary choice and reduced food wastage and led to a landmark assessment, published in *Nature Climate Change* in 2011, revealing that reductions in meat consumption and in food wastage by consumers can provide substantial emissions savings both within the UK and globally [6].

3. References to the research

Comments in bold on individual outputs give information on the quality of the underpinning research and may include the number of citations (Scopus, up to September 2013) and/or the 2012 Thomson Reuters Journal Impact Factor (JIF). The starred outputs best indicate this quality.

[1]* Peer-reviewed journal article, JIF: 2.9

Reay, D.S. (2002) 'Costing climate change', *Philosophical Transactions of the Royal Society Series A* 360 (1801), 2947-2962, DOI: 10.1098/rsta.2002.1063

[2] Peer-reviewed book chapter based on output [1]

Reay, D.S. (2007) 'The Price of Climate Change', chapter in P. R. Sammonds and J. M. T. Thompson (eds.), *Royal Society Series on Advances in Earth Science. From Earthquakes to Global Warming*. London: Imperial College Press, ISBN: 978-1860947629, available upon request.

[3] Peer-reviewed journal article (Houston was an MSc student at Edinburgh, 2008 - 2009)

Houston, K., and Reay, D.S. (2011) 'The impact of ICT on greenhouse gas emissions: how green are virtual worlds?', *Carbon Management* 2(6), 629-643, DOI: 10.4155/cmt.11.62

[4] Peer-reviewed journal article (Korbetis was an MRes student at Edinburgh, 2005 - 2006)

Korbetis, M., Reay, D.S., and Grace, J. (2006) 'New directions: rich in CO₂', *Atmospheric Environment* 40 (17), 3219-3220, DOI: 10.1016/j.atmosenv.2006.01.032

[5]* Peer-reviewed chapter in the European Nitrogen Assessment with Reay as lead author

Reay, D.S., Clare Howard, Albert Bleeker, Pete Higgins, Keith Smith, Henk Westhoek, Trudy Rood, Mark Theobald, Alberto Sanz Cobeña, Bob Rees, Dominic Moran, Stefan Reis (2011) *Societal choice and communicating the European nitrogen challenge*. In: *European Nitrogen Assessment*, Cambridge University Press. 26, 586-601, http://www.clrtap-tfrn.org/webfm_send/334.

[6]* Peer-reviewed journal article, >10 citations in one year, JIF: 14.5

Reay, D. S., Davidson, E.A., Smith, K., Smith, P., Melillo, J.M., Dentener, F., and Crutzen, P.J. (2012) 'Global agriculture and nitrous oxide emissions', *Nature Climate Change* 2, 410-416, DOI: 10.1038/nclimate1458

A further metric of research quality is given by the peer-reviewed knowledge transfer grant that contributed to the preceding outputs: *ClimateWatchers (Interactive exhibit on individual action on climate change)* (2005), sponsor: National Science Week Award, Research Councils UK, value: £2k, awarded to Reay.

4. Details of the impact

Lettered references relate to corroboration sources in Section 5.

Enhanced public engagement with, and understanding of, climate mitigation by individuals

Pathway: One pathway arises through the continuing popularity and influence of the *Climate Change Begins at Home* book [A], much of the content of which is underpinned by the work encapsulated in research output [1], Section 3. First published in 2005, the impacts of the book over the period January 2008 – July 2013 include continuing sales and the commissioning of Reay by Macmillan to write a popular book for children on climate change mitigation by individuals, entitled *Your Planet Needs You!*, which was published in 2009 jointly by the Science Museum [B].

Over the same period Reay has also delivered a wide range of public lectures and media pieces.

Significance and reach:

- Although the majority of the >7,500 to-date sales of *Climate Change Begins at Home* occurred 2005 - 2007, it has continued to sell >250 copies over the period January 2008 – June 2010 [A]. That *Climate Change Begins at Home* has translated directly into household-level changes in behaviour is exemplified in the 2011 case study of the Cayley Family, as presented on the 10:10 Global website. They say: *'We're tackling this as a family, and we're always searching for new ways to cut carbon together. We aren't extremists by any account, but I really do believe that individuals can make an impact by making simple changes day by day. We've been using Dave Reay's 'Climate Change Begins at Home', a really entertaining read, to see what we can do.'* [C].
- *Your Planet Needs You!* sold over 5,000 copies in its first year (2009) and continued to sell over 600 copies in 2010 [B]. The book has been widely praised in the print and broadcast media, for example on The Hour (STV, June 2009) [D].
- Between January 2008 and July 2013, Reay gave 35 public lectures, school and science festival talks (including three British Council events), reaching the UK, Mexico and the Philippines.
- Several of the research outputs cited in Section 3 have also gained considerable media attention. For example, the work published in 2011 on dietary choice and food wastage ([6], Section 3) has received widespread popular media coverage (including ITV.com, Independent, Metro and International Business Times, combined circulation 18million) [E]. The study was described by the UK Government's Chief Scientist as *'a really intriguing study and very important'* [F].

Public policy formation related to climate change mitigation

Pathway: Reay's research into the role of individuals in climate change mitigation has led to his establishment as an expert advisor to government on these issues. For example, research-led evidence given by Reay was cited six times in the UK Government's House of Commons Environment, Food and Rural Affairs Select Committee on *'Climate Change: the citizens' agenda'* (2006 - 2007) [G] and the resultant recommendations for reducing emissions from lighting and stand-by power were adopted in December 2008 European Commission directives [H]. Reay's work on climate change communication and mitigation has also been recognised directly by several MPs and MSPs over the period 2008 – July 2013.

Significance and reach:

- The UK Government response to *Climate Change: the citizens' agenda* confirmed that proposals would be developed and supported under the Eco-Design of Energy-Using Products (EuP) framework directive to restrict standby power usage for most appliances to 2 watts within one year, and 1 watt within three years, such that the impact extends into the period 2008 - 2010 [G]. The European Commission regulations based on these proposals came into force across the EU in 2009 [H].
- The influence within UK and Scottish Government of Reay's research is illustrated by the following statements (both made in 2011). The MP for Edinburgh North and Leith, Member of Environmental Audit Committee and Prime Minister's Special Representative on Global Carbon Trading (2008 - 2010) said: *'Dave Reay's work on climate change communication and individual action has made a substantive impact over several years. His advice on climate change to MPs such as myself has helped to inform policy recommendations and to enhance understanding of climate change by the public and politicians alike.'* [I]. The MSP for Glasgow and Co-Convener of the Scottish Green Party said: *'As Scotland's Climate Change Act worked its way through Parliament [ed: this occurred in 2009], it was vital to raise the awareness of climate science and its implications among MSPs. It was only with a good degree of cross party involvement and continual pressure from outside of politics, that we ended up with a strong Act and world-leading CO₂ targets. Dave Reay's work on climate change communication and individual action has made a substantive impact during that period and since.'* [J].

5. Sources to corroborate the impact

Where two web-links are given, the first is the primary source and the second an archived version.

[A] Climate Change Begins at Home

Reay, D.S. (2005) *Climate Change Begins at Home*, Macmillan, 203pp, ISBN: 978-1403945785. The quoted primary sales figures are from Macmillan Publishers Ltd, Houndmills, Basingstoke, Hampshire, RG21 6XS.

[B] Your Planet Needs You!

Reay, D.S. (June 2009), *Your Planet Needs You!*, Macmillan Children's Books, 176pp, ISBN: 978-0330450959. The quoted primary sales figures (January 2009 - December 2010, with total sales over that time of 5,674) are from Palgrave Macmillan Ltd, address as for [A].

[C] "Shrinking A Family Footprint", a 10:10 report (June 2011)

<http://tinyurl.com/B7-2-S5-XC> or <http://tinyurl.com/B7-2-S5-C>

Evidences household-level behaviour change resulting from 'Climate Change Begins at Home'.

[D] The Hour TV programme on 'Your Planet Needs You!' (STV, June 2009 and on-line)

<http://tinyurl.com/B7-2-S5-XD> Evidence of mainstream media coverage for 'Your Planet Needs You!'. STV has an audience of >4M TV viewers per month and 3.2M digital viewers.

[E] Selected May 2012 media coverage on food wastage research

Wasted Milk causes carbon footprint equivalent to 'thousands of cars' (ITV.com)

<http://tinyurl.com/B7-2-S5-XE1> or <http://tinyurl.com/B7-2-S5-E1>

Drink your milk: waste is equal to gas emissions from 20,000 cars (*Independent*)

<http://tinyurl.com/B7-2-S5-XE2> or <http://tinyurl.com/B7-2-S5-E2>

Waste milk creates excess CO₂, says research (*International Business Times*)

<http://tinyurl.com/B7-2-S5-XE3> or <http://tinyurl.com/B7-2-S5-E3>

Drinking your milk instead of pouring it down the sink can save the planet (*Metro*)

<http://tinyurl.com/B7-2-S5-XE4> or <http://tinyurl.com/B7-2-S5-E4>

Provides evidence of the widespread reach of the coverage of Reay's work, in this example research output [6], Section 3. The quoted on-line circulation figures are from a Meltwater News search, results of which are available upon request.

[F] Factual statement from the UK government Chief Scientist

Provides corroboration of the quote in Section 4 and distribution within Government of the work.

[G] House of Commons Environment, Food and Rural Affairs Committee. *Climate Change: the "citizen's agenda". Eighth Report of Session 2006 - 07, Volume 1 (July 2007)*

<http://tinyurl.com/B7-2-S5-XG> or <http://tinyurl.com/B7-2-S5-G> Evidences I) Reay's advisory role to the government on issues regarding the role of individuals in climate change mitigation (Pages 8, 11, 12, 21, 29, 30, 41, 42, 64 and 66) and II) proposals to be developed and supported under the Eco-Design of Energy-Using Products (EuP) framework directive (Page 31).

[H] European Commission Regulation Document No 1275/2008 (December 2008)

<http://tinyurl.com/B7-2-S5-XH> or <http://tinyurl.com/B7-2-S5-H>

Evidences the adoption of proposals to restrict standby power usage for most appliances by the European Commission (Regulation No. 1275/2008) following the citizen's agenda report [G] and the Eco-Design of Energy-Using Products framework directive.

[I] Factual Statement from the MP for Edinburgh North and Leith (September 2011)

Provides corroboration of the quote given in Section 4. The MP is also a member of the Environmental Audit Committee; Prime Minister's Special Representative on Global Carbon Trading (2008 - 2010) and Chair of the Edinburgh Community Energy Cooperative.

[J] Factual Statement from the MSP for Glasgow / Co-Convener of the Scottish Green Party (June 2011)

Provides corroboration of the quote given in Section 4.