

Reducing Household Energy Use and Carbon Emissions: the potential for promoting significant and durable changes through group participation

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Abstract

This paper reviews published information about a number of community based initiatives which address pro-environmental behaviour change through group participation and which target collections of behaviours or lifestyles. Through examination of published information this paper considers the energy and carbon emission reductions achieved by these initiatives, the durability of those reductions, and the common elements which may play a part in their success. The group-based interventions considered here have been effective in promoting reductions in energy use and carbon emissions, with participants cutting their carbon emissions by approximately 20% within a year. There is also some evidence that these reductions are lasting and that participants continue to make changes to their lifestyles up to three years after participation. The paper highlights the potential of these group-based interventions for promoting significant and durable changes in pro-environmental behaviour and proposes research to explore the mechanisms underlying the success of these groups using the Reasonable Person Model as a theoretical framework.

Keywords: behaviour change, energy reduction, carbon reduction, Reasonable Person Model, low carbon lifestyle

Introduction

The Climate Change Act 2008 commits the United Kingdom to an 80% reduction in greenhouse gas emissions by 2050 compared to 1990 levels, with an intermediate target of 34% by 2020 (HM Government, 2009). Direct use of energy by the domestic sector accounts for approximately 50% of UK greenhouse gas emissions (DEFRA, 2009). Reducing these emissions is therefore crucial to the UK for meeting its reduction targets. The importance of behaviour change in reducing energy use and carbon emissions is reflected by the social marketing strategy recently adopted by the Department of the Environment, Farming and Rural Affairs (DEFRA, 2009) and in government information programmes such as Act on CO₂. The UK Energy Research Centre estimates that changes in individual and household behaviour could contribute a 30 percent cut in emissions on 1990 levels (Spence and Pidgeon, 2009). Despite this potential, however, pro-environmental behaviour change programmes have yet to be successful in delivering significant changes, particularly in the longer term (De Young 2003, Haq et al. 2008, Jackson, 2005). For example, a recent review of 38 interventions targeting household energy use found either no reduction in energy use or a reduction of less than 5% in the majority of the interventions (Abrahamse et al., 2005). Of the 13 studies which considered long term effects (reductions still in effect after 2 or more months) only five reported that reductions were maintained (ibid). If behaviour change programmes are to make a substantial contribution to reduction in energy use and carbon emissions in the UK it is important that they deliver both substantial and lasting change.

Concern has been expressed that many behaviour change programmes focus on a specific behaviour or attitude without attempting to influence related behaviours or overall lifestyle (Spence and Pidgeon, 2009). Nevertheless this continues to be the standard approach to influencing pro-environmental behaviour change (McKenzie-Mohr, 2000, Steg and Vlek, 2009). While this focus has been effective in changing attitudes there remains a troubling gap between attitude and behaviour resulting in limited success in promoting actual changes in behaviour (Barr, 2004, Kennedy et al., 2009, Kollmuss and Agyeman, 2002). Even when interventions focusing on a single behaviour have been successful there is little evidence of impact on other pro-environmental behaviours (Thøgersen and Ölander, 2003). Indeed there is some evidence that concentrating on a single behaviour can be counter-productive as people focus their pro-environmental intentions on that behaviour rather than on behaviours with more significant environmental impacts (Whitmarsh, 2009).

A radically different approach to pro-environmental behaviour change is being adopted by an increasing number of programmes, however, which use a group-based approach and target collections of behaviours or lifestyles (Burgess, 2003, Hargreaves et al., 2008, Howell, 2009, Lockwood and Platt, 2009, Staats et al., 2004). These programmes bring together small groups of people to jointly consider a range of behaviours and attitudes in a study group format similar to those used in health care contexts (Jansson et al., 1998, Landtblom et al., 2008). This paper considers a number of group-based interventions designed to promote reductions in household energy use and carbon emissions and to facilitate shifts towards more environmentally friendly lifestyles. The paper identifies published information about these group-based interventions, considers how they function and the results they achieve, and suggests further research into the mechanisms underlying their effectiveness.

Method

A systematic review of literature about group-based interventions promoting pro-environmental behaviour change was conducted to identify studies which included quantitative information. Pre-defined keywords were used to search a variety of databases, and bibliographies of texts identified in searches were examined for further information. Citation searches were also conducted for papers identified in keyword searches. In total published information containing quantitative information on energy use and/or carbon emissions was found for only four interventions.

The effectiveness of these four interventions in promoting pro-environmental behaviour change was assessed using De Young's five criteria for evaluating behaviour change interventions: reliability, speed of change, particularism, durability, and generality (De Young, 1993).

Results

This section provides a description of how each of the group-based interventions functioned followed by an evaluation of their effectiveness.

Description of Interventions

All of the group-based interventions discussed here had elements in common. They consisted of groups of six to ten people, they met regularly, they had access to reliable information through written material and/or access to a trained "expert", they provided an opportunity to explore the information as a group, and they addressed collections of behaviours with the

stated purpose of reducing the environmental impact of the participants' lifestyles. Groups were usually drawn from a neighbourhood, a workplace or a community of interest such as a faith group or a voluntary group.

United Kingdom EcoTeams

The longest established and largest of the programmes considered here is EcoTeams which is run by Global Action Plan (GAP) both in the UK (GAP, 2006, Nye and Burgess, 2008), and internationally (Staats and Harland, 1995, Staats et al., 2004). UK EcoTeams met once a month for five months with set monthly topics. Meetings were facilitated either by GAP employees (fully-facilitated), or by trained volunteers (semi-facilitated). Participants were provided with information packs and workbooks, and encouraged to explore, discuss and share information. The facilitator had access to further information and advice from GAP (GAP, 2008). Participants monitored reductions through weighing rubbish and recording meter readings. This information was sent to GAP UK which provided personalised reports showing any changes and adjusted for weather conditions.

The UK EcoTeams programme has been assessed both by GAP UK (2006, 2008) through questionnaires and measurement of energy, waste and water use, and by Nye and Burgess (2008) in a DEFRA-commissioned evaluation focusing on energy use and waste reduction. By 2008 a total of 3,602 UK households had participated in EcoTeams and household consumption data were available for 1,096 households (GAP, 2008).

EcoTeams in the Netherlands

EcoTeams in the Netherlands met once a month for eight months with a set monthly topic (Staats et al., 2004). Dutch EcoTeams were provided with information packs and workbooks, and had access either to a trained facilitator or someone at a support centre. Exploration, discussion and sharing of information were encouraged. Participants weighed rubbish and took meter readings to monitor reductions. They recorded these in an individual logbook and submitted this information to GAP who provided feedback about the reductions made by the group (Staats and Harland, 1995). The Dutch EcoTeams programme has been extensively assessed in a longitudinal study of 153 households through questionnaires and measurement of energy, waste and water use (Staats and Harland, 1995, Staats et al., 2004).

Carbon Rationing/Reduction Groups

The third group-based intervention is the Carbon Reduction/Rationing Action Group (CRAG) (Howell, 2009, Seyfang et al., 2007). The CRAG movement is a loosely knit community of people who meet together in groups to reduce their carbon emissions. Unlike EcoTeams, there is no specific model for how CRAGs function, although Ross (2006) provides suggestions. Howell (2009) conducted a survey of 50 people from 5 different CRAG groups and documented the carbon reductions reported by participants. Members of CRAGs agreed how to record changes in energy use and emissions, recorded their own meter and odometer readings, and shared information at regular meetings (Howell 2009). Individual CRAGs chose how often to meet (often monthly) and participants valued the opportunity to discuss changes and share ideas. CRAGs used an annual accounting system and had no trained facilitators, but groups were supported by information on the CRAG website (CRAG 2006-2007).

Green Streets

A slightly different group-based intervention was conducted by British Gas as part of its Green Streets programme (Lockwood and Platt, 2009). In this programme eight households were recruited in each of eight streets to form neighbourhood teams with the intention of reducing the emissions of all the households in the team. The team that made the largest reductions won a cash prize. Green Streets households had access to a dedicated energy advisor who provided information, expert advice and answered queries (Lockwood and Platt 2009). The teams met to discuss and share information. British Gas also provided each group with £30,000 of funding to make improvements to the households, including a mandatory element of renewable energy generation. Green Streets participants were provided with feedback through hand-held meters and monitoring of energy consumption through monthly meter readings.

Evaluation

Reliability

The first criteria for evaluating behaviour change interventions is reliability which measures how successful a technique is at instigating behaviour change (De Young 1993). Published evaluations of group-based interventions have shown average reductions in energy use and carbon emissions of approximately 20% within a year. Table 1 summarises the reductions achieved by the four programmes considered here.

Table 1: Reductions in energy use, carbon emissions, waste and water use in four group-based interventions

Programme	Number of Participants	Percent Reduction	Percent Carbon Reduction	Data collection
UK EcoTeams	1096	Electricity 7 Gas 21 Water 15 Waste 20	17	Meter readings and weights reported by participants
Netherlands EcoTeams	153	Electricity 7 Gas 23 Water 5 Waste 30	Unreported	Meter readings and weights reported by participants
CRAGs	50	Unreported	27	Meter readings reported by participants
Green Streets	64	Energy 25	23	Meter readings collected by British Gas

It is worth noting that the total reduction in carbon emissions for the UK EcoTeams may be higher than that reported here as savings in transport emissions were not recorded. Although reductions were not quantified participants did make changes to their transport use by reducing short car trips (under 2 miles), increasing their use of public transport, and planning to buy more fuel efficient cars (Nye and Burgess, 2008, p.120). Also, although reductions in carbon emissions associated with transport for EcoTeams in the Netherlands were not

recorded, Staats et al (2004) demonstrate significant change in travel mode choice for journeys of less than 5 km after participation in EcoTeams.

It is also worth noting that although some of the reduction in energy use and carbon emissions in the Green Streets programme is attributable to improvements facilitated by the funding provided by British Gas, Lockwood and Platt (2009) emphasize the important role behaviour change played in the project, with only about 50% of the energy savings being attributable to installed measures. They also note that there was considerable variation in energy use between households which was directly attributable to differences in behaviour.

The reductions in energy use, water use, carbon emissions and waste production found in the interventions are a result of changes in a collection of related behaviours. Staats et al (2004) report significant changes in 19 out of 38 measured behaviours after participation in the Dutch EcoTeams and a significant number of UK EcoTeams members adopted at least 22 new pro-environmental behaviours as a result of participation (GAP 2008). Interviews with participants in Green Streets also indicated that the households adopted at least 13 pro-environmental behaviours as a result of participation (Lockwood and Platt 2009).

Overall it appears that the group-based interventions considered here were successful at instigating pro-environmental behaviour changes, leading to significant reductions in energy use and carbon emissions.

Speed of change

All the interventions reviewed here achieved results within one year. Studies of the UK EcoTeams demonstrated results after 5 months, the Dutch EcoTeams after 9 months, and the CRAGs and Green Streets after one year. The actual rate of change is not documented in published sources as studies of the programmes compared information from the start and end of the interventions and did not report intermediate results.

Particularism

The particularism criterion relates to how generally an intervention could be applied (De Young 1993). In terms of population sectors participants in group-based interventions are usually environmentally aware and are already involved in some pro-environmental behaviours (Nye and Burgess 2008; Howell 2009; Staats and Harland 2004). In the Netherlands participants in EcoTeams were asked eight specific questions about environmentally significant behaviour before participating in the groups, and their responses were compared with responses from a representative sample of the Dutch population who were part of a longitudinal study of environmental household behaviour. The EcoTeams participants were found to behave in a more pro-environmental way than 80 percent of the Dutch population (Staats et al 2004).

In the UK EcoTeams the majority of participants interviewed as part of a longitudinal study were also involved in pro-environmental behaviours before joining EcoTeams (Nye and Burgess 2008). These interviewees had all participated in the fully facilitated model where the group was directly recruited by EcoTeams and was facilitated by a member of GAP staff. None of the interviewees had participated in the semi-facilitated model because it was instituted more recently. In the semi-facilitated model the facilitator is a volunteer, recruited and trained by GAP. Participants in this model are usually drawn from the facilitator's existing social networks, rather than recruited directly by GAP. GAP suggests that people

who choose to become directly involved with an environmental charity are more likely to already be involved in pro-environmental behaviours than those who are recruited by a friend or colleague. This suggestion is supported by the comparison of volunteer facilitators with team members in the semi-facilitated model which indicated that team members at the start of the programme displayed fewer pro-environmental behaviours than team leaders. It seems possible, therefore, that the semi-facilitated model may be successful at reaching segments of the population less involved in environmental issues (GAP 2008).

Participants in CRAGs also tended to start with pro-environmental attitudes as indicated by their levels of carbon emissions which were approximately 6% lower than the UK average at the start of the CRAG (Howell 2009).

Green Street participants were drawn from eight different cities, and from a variety of housing types reflecting the proportions found nationally (Lockwood and Platt 2009). The average carbon footprint of participants at the beginning of the study was slightly higher than the UK average and interviews with a sample of participants indicated that there was a variety of attitudes to the environment and to energy use. Interviews suggest that at least part of the motivation for becoming involved was the money provided by British Gas for improvements and the prospect of winning a prize.

Evidence from the programmes considered here suggests that group-based interventions may be best suited to those with prior green intentions, and are not therefore widely applicable. However, evidence about participants in the semi-facilitated EcoTeams model in the UK may suggest that this type of intervention can be applied more widely with training of volunteer facilitators from a wider variety of contexts (GAP 2008). Also the Green Street participants did not start with specifically pro-environmental attitudes, but the funding from British Gas may have encouraged people to get involved with the programme.

Durability and Generality

Two issues identified above are the permanence of changes relating from interventions, and the likelihood of changes in a single behaviour leading to changes in other environmentally significant behaviours (Abrahamse et al., 2005, Haq et al., 2008, Thøgersen and Ölander, 2003). De Young (1993) refers to these as durability and generality, with generality also including the likelihood of individuals encouraging others to change their behaviour. In follow-up studies with 151 participants who had completed EcoTeams in the UK two to three years before, over 90% stated that they had not only maintained the lifestyle changes they had made, but were also doing more to reduce their environmental impact (GAP 2008, p. 31, Nye and Burgess 2008).

In the Netherlands a follow-up study of EcoTeams households six to nine months after completion of the programme showed further significant reductions. Two years after completion the reductions were maintained or improved upon (Staats et al 2004). These participants were compared with a sample matched for pro-environmental behaviours from a representative household survey on environmental behaviour conducted annually in the Netherlands. Eight pro-environmental behaviours were assessed to identify whether the improvement in pro-environmental behaviour might be attributable to participation in the EcoTeams programme. During the first year the pro-environmental behaviour of EcoTeams participants increased significantly more than that of the control group, although the behaviour of the control group improved slightly. Over the following two years the pro-

environmental behaviour of the EcoTeams participants continued to increase, while that of the control group showed no change (Staats et al 2004).

No follow-up information was available for CRAGs or for Green Streets, although Lockwood and Platt (2009) note that some people living in the participating streets who were not part of the Green Street team were motivated to reduce their energy use and carbon emissions. Also, at least one of the Green Street teams held community meetings to share their experience and advice with people who had not been involved in the intervention.

Overall, where information is available, it seems that the group-based interventions considered here promote lasting change, and that group-based interventions have the potential both to encourage further pro-environmental behaviour change in individuals and to inspire them to encourage others to adopt changes

Discussion

The evidence presented above demonstrates that group-based interventions promote significant and durable pro-environmental behaviour change of the scale needed to begin to address UK carbon emission targets. These interventions appear to fulfil all of De Young's criteria for successful behaviour change programmes except particularism (De Young 1993). Previous researchers suggest that there are three common elements of group-based interventions which support pro-environmental behaviour change: provision of information; feedback; and the group environment (Burgess, 2003, Hargreaves et al., 2008, Howell, 2009, Lockwood and Platt, 2009, Staats et al., 2004). Although these elements have been identified as important, it has also been suggested that more research is needed to understand the mechanisms underlying the success of these groups (Hargreaves et al., 2008, Staats et al., 2004).

Further Work

A potential framework for understanding the mechanisms in group-based interventions would be to view the intervention as a supportive environment. Such a framework could be provided by the Reasonable Person Model which suggests that environments – physical or conceptual – can be evaluated from the perspective of their ability to support human informational needs (Kaplan and Kaplan, 2003, 2009, Kaplan, 2000). Kaplan and Kaplan define these as the needs “to explore, to understand, to enhance competence, to be part of the solution, [and] to participate with others toward meaningful goals” (2009 p.10).

Further work is proposed into identifying the mechanisms underlying the success of group-based interventions in promoting pro-environmental behaviour change using the Reasonable Person Model as a theoretical framework. An in-depth, longitudinal study will be conducted evaluating six groups which are part of a programme being designed and implemented by Transition Leicester. It is hoped that this will not only provide insight into the processes and mechanisms of group-based interventions, but also allow the identification of elements which could be applied in different contexts or in different ways to reach a broader segment of the population.

References

- ABRAHAMSE, W., STEG, L., VLEK, C. & ROTHENGATTER, T. (2005) A review of intervention studies aimed at household energy conservation. *Journal of Environmental Psychology*, 25, 273-291.
- BARR, S. (2004) Are we all environmentalists now? Rhetoric and reality in environmental action. *Geoforum*, 35, 231-249.
- BURGESS, J. (2003) Sustainable consumption: is it really achievable? *Consumer Policy Review*, 13, 78.
- CRAGS (2006-2007) Carbon Rationing Action Groups. <http://www.carbonrationing.org.uk> [accessed 30 April 2010]
- DEFRA (2009) *Sustainable Development Indicators in Your Pocket*, London, DEFRA.
- DE YOUNG, R. (1993) Changing behavior and making it stick. *Environment and Behavior*, 25, 485-505.
- GAP (2006) *Changing Environmental Behaviour: A review of the evidence from Global Action Plan*. London, Global Action Plan.
- GAP (2008) *EcoTeams Evaluation Report*. London, Global Action Plan.
- HAQ, G., WHITELEGG, J., CINDERBY, S. & OWEN, A. (2008) The use of personalised social marketing to foster voluntary behavioural change for sustainable travel and lifestyles. *Local Environment*, 13, 549-569.
- HARGREAVES, T., NYE, M. & BURGESS, J. (2008) Social experiments in sustainable consumption: An evidence-based approach with potential for engaging low-income communities. *Local Environment*, 13, 743-758.
- HM GOVERNMENT (2009) *The UK Low Carbon Transition Plan: National Strategy for Climate & Energy*. London Stationary Office,.
- HOWELL, R. (2009) *The Experience of Carbon Rationing Action Groups: Implications for a Personal Carbon Allowances Policy*. Oxford, UK Energy Research Centre.
- JACKSON, T. (2005) Motivating sustainable consumption. *A review of evidence on consumer behaviour and behavioural change*. Guildford: University of Surrey, Centre for Environmental Strategy.
- JANSSON, W., ALMBERG, B., GRAFSTRÅM, M. & WINBLAD, B. (1998) THE CIRCLE MODEL--SUPPORT FOR RELATIVES OF PEOPLE WITH DEMENTIA. *International Journal of Geriatric Psychiatry*, 13, 674-681.
- KAPLAN, S. (2000) Human nature and environmentally responsible behavior. *Journal of Social Issues*, 56, 491-508.
- KAPLAN, S. & KAPLAN, R. (2003) Health, Supportive Environments, and the Reasonable Person Model. *American Journal of Public Health*, 93, 1484-1489.
- KAPLAN, S. & KAPLAN, R. (2009) Creating a larger role for environmental psychology: The Reasonable Person Model as an integrative framework. *Journal of Environmental Psychology*, 29, 329-339.
- KENNEDY, E. H., BECKLEY, T. M., MCFARLANE, B. L. & NADEAU, S. (2009) Why We Don't "Walk the Talk": Understanding the Environmental Values/Behaviour Gap in Canada. *Human Ecology Review*, 16, 151-160.
- KOLLMUSS, A. & AGYEMAN, J. (2002) Mind the Gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, 8, 239-260.
- LANDTBLOM, A., LANG, C. & FLENSNER, G. (2008) The study circle as a tool in multiple sclerosis patient education in Sweden. *Patient Preference and Adherence* 2, 225-232.

- LOCKWOOD, M. & PLATT, R. (2009) *Green Streets: Final Report to British Gas*. London, IPPR.
- MCKENZIE-MOHR, D. (2000) Fostering Sustainable Behavior Through Community-Based Social Marketing. *American Psychologist*, 55, 531-537.
- NYE, M. & BURGESS, J. (2008) *Promoting Durable Change in Household Waste and Energy Use Behaviour*. Norwich: University of East Anglia.
- ROSS, A. (2006) CRAGS: a short guide. <http://www.carbonrationing.org.uk> [accessed 30 April 2010]
- SEYFANG, G., LORENZONI, I. & NYE, M. (2007) *Personal carbon trading: notional concept or workable proposition? Exploring theoretical, ideological and practical underpinnings*. Norwich, CSERGE Working Paper, EDM 07-03.
- SPENCE, A. & PIDGEON, N. (2009) Psychology, climate change and sustainable behavior. *Environment*, 51, 8-18.
- STAATS, H. & HARLAND, P. (1995) *The Ecoteam Program in the Netherlands, Study 4: a longitudinal study on the effects of the Eco Team program on environmental behavior and its psychological backgrounds*. Leiden: Leiden University, Centre for Environmental and Energy Research.
- STAATS, H., HARLAND, P. & WILKE, H. A. M. (2004) Effecting Durable Change: A Team Approach to Improve Environmental Behavior in the Household. *Environment and Behavior*, 36, 341-367.
- STEG, L. & VLEK, C. (2009) Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology*, 29, 309-317.
- THØGERSEN, J. & ÖLANDER, F. (2003) Spillover of environment-friendly consumer behaviour. *Journal of Environmental Psychology*, 23, 225-236.
- WHITMARSH, L. (2009) Behavioural responses to climate change: Asymmetry of intentions and impacts. *Journal of Environmental Psychology*, 29, 13-23.