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Abstract
A number of recent films such as *An Inconvenient Truth* and *The Age of Stupid* aim not merely to inform their audience about climate change, but to engage them in taking mitigation action. This paper outlines the transtheoretical model of behavioural change, which incorporates six *stages of change* that individuals progress through as they change their behaviour, and ten associated *processes of change*. Using four climate change films as illustrations, I show how the model can be applied to identify the processes of change employed or depicted by sustainability communications. I then discuss research on the impacts of the films in the light of this analysis, considering the strengths and limitations of the movies' use/portrayal of processes of change with regard to encouraging viewers to change their behaviour. The paper concludes with recommendations for how film may be used more effectively as a tool to inspire climate change mitigation action.

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1 Introduction

In recent years, a number of full-length 'climate change films' have been made, including drama, documentaries, and hybrid genres. These range from *The Day After Tomorrow*, in which climate change is the basis for a typical Hollywood disaster movie, through documentaries that explain the problem, to *Just Do It*, which focuses on the exploits of climate action groups. Most of these films aim not merely to inform their audiences about climate change, but to persuade people to take action to reduce their greenhouse gas (GHG) emissions, and/or to get involved in political campaigns or even illegal 'direct action' (such as attempting to occupy coal-fired power stations). It is important to understand how climate change films attempt to engage viewers and whether these processes can be effective in motivating behavioural change.

Film offers a number of advantages as a means of promoting climate change mitigation action to individuals. Visual images can convey messages instantly in a way that makes them memorable (Nicholson-Cole, 2005), and movies in particular have immediacy, allowing us to receive information as if we were with the people speaking/acting. Such 'messengers' need to be credible and likely to be trusted (Breakwell, 2000; Chess and Johnson, 2007; Moser, 2008), and information should be presented by people with whom the intended audience can identify (Kahan, 2010). But information alone is not enough: knowledge by itself does not lead to action (Blake, 1999; Hungerford and Volk, 1990). Pooley and O'Connor (2000) and Moser (2007) argue that there is a need to appeal to people's emotions rather than just cognitive processes, and films are well-placed to do this through their use of imagery, music, and sound effects.

The temptation with a threat as great as climate change might be to use the dramatic possibilities of film to depict climate catastrophe. This is a common theme in climate discourses (Hulme, 2008), and Tickell (2002, p.737) suggests that we may need a "useful catastrophe or two" to "illuminate the issues". However, research by Spence and Pidgeon (2010) and Morton et al. (2011) suggests that positive framing of climate change mitigation, rather than focussing on what will be lost if we do not act, promotes more positive attitudes towards action. Fear can undermine belief that it is possible for individuals to 'make a difference' (O'Neill and Nicholson-Cole, 2009; Vasi and Macy, 2003) and may prompt undesirable defensive responses (Moser, 2007; Witte and Allen, 2000). Therefore it is recommended that communications about climate change should explain or show what people can do to mitigate the problem (Lorenzoni et al., 2006; Moser and Dilling, 2004).

Social cognitive theory posits that an important way that people learn is through observing others' attitudes, behaviour, and the outcomes of that behaviour (Bandura, 1977). Media programmes (including films) featuring characters whom the audience like and identify with can improve knowledge and change attitudes; they can model desirable behaviours, which increases viewers' sense of self-efficacy (belief that they can adopt the behaviours) as well as cognitive skills regarding those behaviours; and they can motivate and positively reinforce action through depicting rewards for desirable behaviours and punishments for those that are undesirable (Bandura, 2004).

This theory is put to use in entertainment-education (E-E). E-E involves using entertainment media programmes such as radio serials/soap operas (e.g. Papa et al., 2000; Vaughan et al., 2000; Wray et al., 2004), television dramas (e.g. Hether et al., 2008), and telenovelas (e.g. Wilkin et al., 2007) as a means to influence viewers' knowledge, attitudes, and behaviour regarding social concerns. E-E has been shown to be successful in changing attitudes and behaviour with respect to a number of issues, including family planning (Vaughan and Rogers, 2000), HIV prevention (Vaughan et al., 2000), breast cancer screening (Hether et al., 2008; Wilkin et al., 2007), domestic violence (Usdin et al., 2004), and dowry payments (Papa et al., 2000).

Moyer-Gusé (2008) explains that E-E works through narrative engagement as well as the identification with and emulation of characters that is predicted by social cognitive theory. She suggests that the narrative format of E-E means that viewers are less likely to perceive it as having a persuasive intent, which may reduce the reactance sometimes triggered when persuasive messages are perceived as a threat to freedom, leading to message rejection. The narrative format also leads to

the audience being engaged in a more immersive and less critical way (Shrum, 2004, cited in Moyer-Gusé, 2008) and therefore less likely to counter-argue with the persuasive message embedded in the storyline. Enjoyment of the story and identification with one or more characters reduces avoidance, another problem for overtly persuasive messages (Moyer-Gusé, 2008). Climate change films can utilise the E-E approach, aiming to provide an entertaining and engaging narrative.

However, there are many psychological and contextual barriers (e.g. social norms, lack of enabling infrastructure) that may prevent people from taking action even if they are inspired to do so (Gifford, 2011; Howell, 2011; Lorenzoni, Nicholson-Cole, and Whitmarsh, 2007). It can also be difficult to overcome the force of habit (Hargreaves, Nye, and Burgess, 2010; Oeuellette and Wood, 1998; Webb and Sheeran, 2006).

Efforts have been made to investigate the impact of climate change films on viewers' attitudes and (occasionally) behaviour. This includes research on *The Day After Tomorrow* (Balmford et al., 2004; Leiserowitz, 2004; Lowe, 2006; Lowe et al., 2006; Reusswig, Schwarzkopf, and Pohlenz, 2004); *An Inconvenient Truth* (Beattie, 2011; Beattie, Sale, and McGuire, 2011; Nolan, 2010); *The Age of Stupid* (Howell, 2011; 2012); and *Just Do It* (Lander, 2012). These studies give a mixed picture: the films generally raise concern about climate change, and often promote motivation to act or even behavioural intentions. The effect on behaviour is not so clear, especially as it is rarely studied and there are methodological problems with doing so (Howell, 2012).

Behaviour change is a process, rather than an event. In Section 2 I introduce a process model of behavioural change, the *transtheoretical model* (also known as the *stages of change model*), which has potential for use in the field of sustainability-related communication because it can help identify the processes of change that are best employed or modelled by movies for viewers at different stages of change. To illustrate how the model might be useful, four climate change films that vary in terms of intent, genre, focus, mood and messages are briefly described (Section 3), then analysed using core concepts of the model (Section 4), to investigate how they might encourage individuals to take climate change mitigation action of various kinds, and to draw lessons for future films (and indeed, sustainability communication more generally) (Section 5). Conclusions are presented in Section 6. The focus of the paper is on presenting the model and giving an example of how it might be employed, in the belief that it may prove a valuable tool for use in empirical research and by climate change communication practitioners seeking to improve the efficacy of their work. A rigorous investigation involving identifying film viewers' stage of change with regard to particular climate change mitigation actions and testing whether films portraying different processes of change promote stage progression is not attempted here. Instead, other analyses are used insofar as possible to discuss the impacts of the films in the light of the insights gained from the model.

2 The transtheoretical model of behavioural change

2.1 Stages and processes of change

The transtheoretical model (TTM) of behavioural change was developed by James Prochaska, Carlo DiClemente, and colleagues, within the field of health psychology (DiClemente and Prochaska, 1982; DiClemente et al., 1991; Prochaska, 1994; Prochaska and DiClemente, 1982; 1983; Prochaska, DiClemente, and Norcross, 1992; Prochaska and Velicer, 1997; Prochaska et al., 1994). Their research on interventions to help individuals overcome addictions and/or develop healthy behaviours suggests that behavioural change is a process involving several stages, defined in Table 1 (Prochaska, DiClemente, and Norcross, 1992; Prochaska and Velicer, 1997). Individuals do not necessarily progress through these stages linearly, but may 'relapse' back to an earlier stage (Prochaska, DiClemente, and Norcross, 1992), as illustrated by Figure 1.

The model also identifies ten common processes used to facilitate behavioural change (Prochaska and Velicer, 1997), outlined in Table 2. Different processes of change have been found to be emphasised more at different stages of change, with 'cognitive/affective processes' such as

consciousness-raising and self-re-evaluation utilised more at earlier stages of change, while 'behavioural processes' such as stimulus control and counter-conditioning are more important at later stages (DiClemente and Prochaska, 1982; DiClemente et al., 1991). Table 3 shows the change processes considered most important at each stage of change. Proponents of the model recommend that processes of change should be matched to the stage of change reached by the target individual/group (Prochaska, DiClemente, and Norcross, 1992; Prochaska and Velicer, 1997).

Individuals at later stages of change report higher levels of 'self-efficacy' (confidence that they can change their behaviour and maintain changes) than those at earlier stages of change (DiClemente et al., 1991). There are also changes in individuals' 'decisional balance' (relative weighting of the pros and cons of changing their behaviour), with progression from contemplation to action being associated with a significant increase in the evaluation of pros of change, and a smaller decrease in the evaluation of cons (Hall and Rossi, 2008; Prochaska, 1994).

2.2 Applications and criticisms

The TTM has been used to design interventions to promote positive behaviours such as physical activity/exercise (Adams and White, 2003; Spencer et al., 2006), healthy eating (Armitage et al., 2004; Horwath, 1999; Spencer et al., 2007), and mammography screening (Ashworth, 1997; Spencer, Pagell, and Adams, 2005), as well as to help people avoid pregnancy and sexually-transmitted diseases (Horowitz, 2003) and overcome harmful behaviours such as smoking and substance abuse (Migneault, Adams, and Read, 2005; Spencer et al., 2002). The apparent success of some of these communication and intervention programmes suggests that it might be worth applying insights from the model to the promotion of lower-carbon and other sustainability-related behaviours.

However, the model has garnered little attention in the sustainability field to date. The UK Department for Environment, Food and Rural Affairs employs it "on the basis of its conceptual lessons only and does not use it to inform the development of practical interventions" (Defra, 2009, p.5). A study by Duddleston, Stradling, and Anable (2005) categorised people according to stages of change with regard to travel attitudes and behaviour, and Steg (2008) suggests tailored information could be given according to stage of change to promote household energy conservation. He, Greenberg, and Huang (2009) use the model to assess the utility of existing energy feedback technologies designed to motivate sustainable energy consumption behaviours, and to make recommendations for the design of future feedback technologies suitable for individuals at different stages of change regarding sustainable energy usage. Two studies (Chib et al., 2009; Gatersleben and Appleton, 2007) have attempted to categorise participants with regard to waste behaviours and cycling respectively, and then implement an intervention designed to change behaviour, although the categorisation of stages did not necessarily match the definitions used in the TTM and the interventions were not tailored to different stages of change.

Questions have been raised about both the theoretical validity of aspects of the TTM, and the effectiveness of model-based interventions (Adams and White, 2003; Bridle et al., 2005; Herzog et al., 1999; Rosen, 2000; Weinstein, Rothman, and Sutton, 1998). However, researchers suggest that many studies are poorly designed, and stage-based interventions often fail to represent accurately all facets of the TTM (Ashworth, 1997; Bridle et al., 2005; Hutchison, Breckon, and Johnston, 2009).

2.3 The utility of the TTM with respect to sustainability communications

Although there is clearly a need for more research into the theoretical basis of the model and the effectiveness of well-designed interventions, the evidence that currently exists that different change processes are used at different stages of change (DiClemente and Prochaska, 1982; DiClemente et al., 1991; Herzog et al., 1999; Rosen, 2000) makes an analysis of the processes employed by or modelled in climate change films worthwhile because this helps with understanding how different films (and different types of content) might appeal to and motivate different audiences. For

example, even if behavioural change should be conceptualised as a continuum, rather than as progress through discrete stages, as Bridle et al. (2005) and Weinstein, Rothman, and Sutton (1998) suggest may be the case, it seems likely that different change processes will be important as individuals move along the continuum from unawareness to altered lifestyles.

Sood, Menard, and Witte (2004) argue that stage models of change are important in the design and evaluation of E-E, because they help with the identification of the stage of change intended audiences have reached, with designing messages appropriate for these audiences, and with mapping and understanding changes made in response. By extension, the TTM can be employed in the design and evaluation of behaviour change communications more generally. Borrayo (2004), for example, describes how the TTM was used to design a short film to promote breast cancer screening, while Cottone and Byrd-Bredbenner (2007) applied the TTM to evaluate the effectiveness of the film *Super Size Me* as a tool in nutrition education, and were able to determine the movie's impacts on a range of model parameters such as stage of change and self-efficacy. This aids with comprehending not only *whether* a particular communication promotes change, but *how* it might do so. Stage models such as the TTM are also very sensitive to change, and thus can add to the literature on media effects. An evaluation that simply measures whether a desired end result has been achieved (e.g. whether viewers of a climate change film have adopted particular lower-carbon behaviours) might conclude that it has no effect, where an evaluation using the TTM could discover that the film had encouraged stage progression, if not actual behavioural change.

The TTM is not the only stage model of change, but it was chosen for this analysis because it is an extremely popular and enduring model (Horwath, 1999; Spencer et al., 2007) and has been used successfully both to design interventions promoting a variety of behaviours (Spencer et al., 2006; Spencer et al., 2002; Spencer, Pagell, and Adams, 2005) and to evaluate communications in other fields (e.g. Cottone and Byrd-Bredbenner, 2007). Using the model to analyse what processes of change climate change movies depict should help to identify which audiences those films are best suited to (communication evaluation), and how such films could be improved by focussing on more or different processes (communication design).

3 Four climate change films

The films examined in this paper were chosen to offer variety in terms of genre, mood, messages, and filmmakers' intentions, and also because some research has been done on the impact of each film. It is necessary to have this available in order to discuss the effects of the films in light of the insights gained from the TTM.

3.1 The Day After Tomorrow (USA, 2004)

Unlike the other films examined here, which all have associated websites promoting personal action to mitigate climate change, it is not clear that the makers of Hollywood climate-catastrophe movie *The Day After Tomorrow* had any intention to promote behavioural change. Although director Roland Emmerich spoke of being able "to give people a message" (Gilchrist, 2004), he is also quoted as saying, "We just wanted to make a movie people would enjoy" (Bowles, 2004). As the film did well at the box office, ranking sixth highest-grossing disaster movie in the USA since 1979 (Box Office Mojo, 2011), and some scientists and other commentators welcomed the fact that it might bring climate change to public attention, despite criticising its many scientific inaccuracies (see e.g. Hyde, 2004; Monbiot, 2004; ScienceDaily, 2004), the film is worth including in this analysis.

The movie is pure fiction, with a familiar, plucky-hero-overcomes-disaster narrative. Dennis Quaid stars as paleoclimatologist Jack Hall, whose warnings about the potential for abrupt climate change go unheeded by the USA government. Global warming then causes a series of extreme weather events and the shutdown of the Gulf Stream, ushering in a new ice age in Western Europe

and North America within a matter of days. Spectacular special effects and iconic images include the Statue of Liberty hung with enormous icicles and the destruction of the famous 'Hollywood' sign by a tornado. Jack's son Sam is stranded in New York and Jack, promising "I will come for you", sets off from Washington to drive and then walk through the storm to reach him. They survive (with a few friends) and are airlifted to Mexico, where millions of Americans are living as refugees.

3.2 An Inconvenient Truth (USA, 2006)

Perhaps the best-known climate change film is *An Inconvenient Truth*, which won an Academy Award® for Best Documentary Feature. The website associated with the movie, www.climatecrisis.net, states that the estimated worldwide audience for the film was 5 million people; Box Office Mojo (2011) puts worldwide earnings at US$49.8 million.

The film shows former Vice President of the USA Al Gore giving a slideshow presentation of the evidence for climate change and discussing actual and predicted impacts, using graphs, maps, statistics, photographs, and animations. Interspersed with the lecture are segments that focus on Gore's life: for example, his young son's near-fatal car accident and his sister's death from lung cancer. These sections are illustrated with news clips and stills as well as film footage, with (sometimes emotional) voiceovers by Gore.

Almost the whole movie focuses on the problem of climate change; only at the very end does Gore touch on solutions (such as renewable energy and carbon capture and storage). He finishes his presentation by stating that "Future generations may well have occasion to ask themselves, 'What were our parents thinking? Why didn't they wake up when they had a chance?' We have to hear that question from them, now." The credits sequence then includes a list of things to do, such as "Buy energy efficient appliances"; "When you can, walk or use a bicycle"; and "Write to Congress".

3.3 The Age of Stupid (UK, 2009)

Echoing the question with which Gore ends *An Inconvenient Truth*, *The Age of Stupid* features Pete Postlethwaite as an old man living alone in 2055 in a world devastated by climate change, watching documentary footage from 2008 and asking, "Why didn't we save ourselves while we had the chance?" The movie thereby combines a fictional dystopian future with six interwoven documentary strands focussing on personal stories that highlight different aspects of climate change and fossil fuel dependency. Animated sequences illustrate information such as average energy use per person in different countries.

Characters include UK wind farm developer Piers, struggling to overcome local opposition to proposed turbines; 82-year-old French mountain guide Fernand, through whose eyes we see the retreat of Alpine glaciers; businessman Jeh, starting up a low-cost airline in India; and lifelong Shell employee Alvin, who lost his home and saved over 100 people when Hurricane Katrina hit New Orleans. It is he who, reflecting on humanity's wastefulness, names our age "The Age of Stupid".

The Age of Stupid and associated Not Stupid campaign aimed to "turn 250 million viewers into physical or virtual activists" (Not Stupid, undated). The film premiere was screened in 62 cinemas simultaneously around the UK in March 2009, and a 'global premiere' took place the following September in 63 different countries. In addition, there have been 1497 screenings organised by individuals and groups of various kinds (Indie Screenings, undated).

3.4 Just Do It (UK, 2010)

Subtitled "A tale of modern-day outlaws", *Just Do It* is a feature-length documentary by Emily James, who spent a year 'embedded' in UK climate action groups Plane Stupid, Climate Rush, and Climate Camp, filming their meetings and direct action campaigns. Viewers see activists

blockading the Royal Bank of Scotland headquarters in London in protest at "banks which finance climate change", attempting to breach a security fence to shut down a coal-fired power station, and locked in cages after being pre-emptively arrested en-route to protest at the UN climate conference in Copenhagen in December 2009. The film also reveals the meticulous planning, consensus decision-making, and practical preparations behind the scenes.

In addition to the action, the film features interviews with people talking in retrospect about their experiences, and their thoughts and feelings about climate change and involvement in the campaigns. Like *The Age of Stupid*, *Just Do It* follows particular individuals, but unlike in the former film, we hardly see anything of their personal lives – viewers are invited to relate to them only as activists.

The film features lively background music and upbeat, humorous narration by one of the activists. Arrests and police violence are documented but the action is generally framed very positively.

4 Analysis: climate change films and processes of change

Each film was watched more than once, and detailed notes were made about the content, and the images and music used in different scenes. These notes were then used to identify examples of the TTM processes of change (such as given below). In some cases there were many examples, in others only one or two; the following analysis attempts to reflect the weight given in each film to each process, determined by how many examples of each process were identified and an estimate of the relative amount of time accorded to each in each film.

4.1 The Day After Tomorrow

The process most frequently in evidence in this film is dramatic relief (emotional engagement). Opening shots panning over Antarctica to haunting background music invite appreciation of the beauty of nature. However, danger is abruptly signalled: the ice shelf from which Jack is drilling ice cores cracks in seconds, almost under his feet. Thereafter, the sense of threat builds steadily as weather events become rapidly more extreme and news reports convey surprise and alarm. The use of iconic images such as the Hollywood sign and the Statue of Liberty encourages viewers to experience shock and fear because of the magnitude of the disaster and what could be lost. Set against the large-scale action are many personal stories to engage the audience's empathy with, and therefore concern for, the characters: for example, Sam's romantic attachment to a classmate; the fate of a child with cancer; and above all, Jack's mission to reach his son in New York.

Early in the film, Jack gives a presentation to an international gathering of scientists and politicians during which he explains how global warming could possibly lead to the shutdown of the Gulf Stream. This and scenes in which scientists are creating, using, and explaining climate models, promote consciousness-raising about climate change among viewers because they provide information about the potential impacts of the problem, and show how scientists predict such effects.

Some characters in the film experience environmental and self-re-evaluation as they come to understand the extent of the impacts of anthropogenic global warming and accept responsibility for the problem. Jack declares that the future "depends on whether or not we're able to learn from our mistakes", and at the end of the film the new President of the USA (the formerly intransigent Vice President) announces on TV, "For years, we operated under the belief that we could continue consuming our planet's natural resources without consequence. We were wrong. *I* was wrong."

4.2 An Inconvenient Truth

The process most frequently employed by *An Inconvenient Truth* is consciousness-raising, through the traditional method of a lecture. Many of the data are presented in ways that encourage dramatic

relief, by making human connections that prompt feelings of empathy. For example, Gore graphically illustrates how millions of people will be affected by sea-level rise, and shows photographs of scientists to give a human face to their work. He also employs humour to develop rapport with his audience, and the non-lecture sections of the film seem designed specifically to encourage sympathetic emotional engagement with Gore as a person.

Viewers are encouraged to begin environmental re-evaluation by Gore showing images of the devastation wrought by Hurricane Katrina while stressing that this scale of disaster is something *new* for the USA, and to connect environmental impacts directly with human behaviour through the juxtaposition of images of destruction of nature alongside smoking industrial chimneys. Gore models self-re-evaluation through talking about how the near death of his son made him re-think his purpose in life, and how his sister's death from lung cancer painfully brought home to him his family's part in growing tobacco. His questions at the end about how future generations will regard us appear to be a plea for viewers to 'wake up' and engage in re-evaluation of their behaviour.

Self-liberation is promoted towards the end of *An Inconvenient Truth*, when Gore gives a 'pep talk' about what "we" have achieved, such as the successes of the civil rights movement, suggesting that we have the ability to mitigate climate change, and urging people to take action: "It is your time to seize this issue. It is our time to rise again to secure our future." Social liberation is also touched upon: Gore mentions technologies such as renewables and carbon capture and storage, which offer societal-level alternatives to carbon-intensive electricity generation.

4.3 The Age of Stupid

Much of this film involves consciousness-raising in various ways, including the animated sequences that present statistics and explain proposed climate mitigation policies, and the documentary strands that highlight aspects of the problem including causes, consequences, and responses. Piers and his wife Lisa are shown calculating their household carbon footprint, modelling another form of consciousness-raising (and environmental re-evaluation), because through this they discover the relative GHG emissions associated with different activities, and understand better the contribution they are making to climate change.

Dramatic relief is a strong feature: for example, the imagery of the fictional dystopian future (refugee camps, famous landmarks destroyed etc), the edgy, repetitive music associated with these scenes, and the (fictional) news clip voiceovers that announce, for instance, that it has become necessary to eat pets all suggest a sense of threat. Viewers are also invited to engage emotionally through characters to empathise with (an intimate portrait of Piers and his home life is presented, including footage in which he and Lisa are drinking their morning cup of tea in bed while the answerphone plays a wind farm opponent's threatening message, though we don't see inside the lives of the wind farm protestors), and characters who are less attractive (airline-entrepreneur Jeh raging at his employees). A common discourse in the film is one of emergency, even catastrophe: humans "face extinction", not having "saved ourselves" from "climate crisis"; we should treat climate change like "a war situation".

Environmental and self-re-evaluation are often intertwined: Fernand says, "I think everyone in the future will perhaps blame us for not thinking to protect the environment" and Postlethwaite's character (who frequently uses the words "our" and "we") speaks regretfully of the fatal impacts on his children and grandchildren of his generation's failure to act. The title suggests that we are acting stupidly, and the opening credits emphasise the personal message by stating "and you" after the list of individuals featured in the film.

Self-liberation is modelled by Piers and Lisa deciding not to fly on holiday. A small part of the film portrays counter-conditioning: Piers and family travel to France by train rather than flying; they also talk about other ways they reduce their carbon footprint. Fernand is seen growing his own vegetables. Ideas for social liberation include mention of the policies of contraction and convergence and personal carbon rationing, as well as the storyline about wind farm developments, and Fernand, Piers, and Lisa attend protests to demand change.

4.4 Just Do It

This film has a rather different emphasis to the previous two, in that it focuses on climate change mitigation action rather than on the problem. Viewers see self-liberation in practice as people go through the process of making a commitment to act (in the form of political campaigning rather than personal emissions reductions) and preparing to do so (then actually carrying out the action). The film also expresses a strong belief that it is possible to effect change, although when activist Marina is asked, "Does all of this do any good?" she pauses for a long time. Her eventual response stresses how taking part in direct action is empowering and involves "taking back control of your life", very much a self-liberation process. Social liberation is presumably the desired end of campaigners' actions, although there is little in the film about proposed alternatives to the policies and practices they oppose, other than the conversion of abandoned land and greenhouses near Heathrow airport into a thriving community garden.

Helping relationships are very prominent in *Just Do It*. Protestors plan and carry out actions together in 'affinity groups', and share skills, food, and tools. At one point an activist is caught by a policeman; he shouts "de-arrest!" and other activists help release him from the officer and thereby escape arrest.

Consciousness-raising is also focussed on action rather than the problem: the film shows how affinity groups work, how consensus decisions are taken, and what actually happens at protests.

Dramatic relief is encouraged by the use of lively background music, focus on particular characters to relate to, and humour. For example, footage of the protest at the G20 meeting in 2009 is accompanied by the narrator saying, "Climate Camp are planning to turn the heart of the financial district into a street party"; when police in riot gear move in he calls them "a bunch of uninvited party-poopers." The violence of the police response is effectively highlighted and given 'shock value' by this light-hearted introduction.

5 Discussion

The foregoing analysis suggests that these films employ or depict several processes of change that the TTM suggests should encourage attitudinal or behavioural change. No research has yet attempted to assess whether climate change films have been successful in promoting stage progression according to the model; however, as mentioned in Section 1, various studies have attempted to determine the impact of the films examined here on viewers' attitudes, behavioural intentions, and in some cases, actual behaviour. These and other studies can shed some light on how films might encourage climate change mitigation action.

The processes of change most frequently associated with these films are consciousness-raising and dramatic relief. Visual media are particularly suitable for consciousness-raising because of their ability to convey new information and complex ideas quickly and memorably (Nicholson-Cole, 2005). Given that people need to trust and identify with 'messengers' (Chess and Johnson, 2007; Kahan, 2010), and with media characters from whom they might learn through emulation (Bandura, 2004), it is important that a range of figures (whether fictional or real) appear in films that attempt to influence audiences. Research on the impacts of *The Age of Stupid* found that viewers did not universally empathise with wind farm developer Piers (Howell, 2011) so it is useful that the film also features other, quite different individuals. In *Just Do It,* almost all the activists followed are young, and all are white, which may give an unintended message about who the film is relevant to, and/or limit its appeal. Audience members commented on the lack of older people and the fact that characters appeared to be engaged full-time in activism instead of having jobs, which had a distancing effect (Lander, 2012). *An Inconvenient Truth* relies on the credibility of Al Gore for its consciousness-raising effect; no doubt his celebrity encouraged interest in the film, but in the USA, Republicans were far less likely than Democrats to report that it influenced their belief in global warming (Borick and Rabe, 2010).

Film is an ideal medium for dramatic relief: storytelling, vivid imagery, music, pace, and sound effects can all be used to emotionally engage an audience. As discussed earlier, there can be problems when the presentation creates feelings of fear. *The Day After Tomorrow* and *The Age of Stupid* both utilise a 'climate catastrophe' narrative, but in the case of the former film this was lightened by humour and was resolved by an upbeat ending – the threat to the characters with whom viewers are encouraged to identify seemed to be over. Howell (2011) found that viewers of *The Age of Stupid* did not generally find the disaster-framing of the movie disempowering, exhibiting increased motivation to act and belief that they could do something about climate change immediately after seeing the film; however, she suggests that this could be because they already knew what to do to reduce emissions.

Climate change films can also encourage viewers to engage in environmental and self-re-evaluation. This again may need to be modelled by characters they can relate to (Bandura, 2004). In *The Day After Tomorrow*, Jack's struggle to get the Vice President of the USA to listen to his warnings could lead viewers to infer that responsibility lies with scientists and politicians. Scientists are responsible for communicating the threat to politicians (never the public in this film); the politicians are the ones ignoring the message and refusing to take action. There is no storyline about individual mitigation behaviour. For example, nobody mentions, let alone questions, the GHG emissions associated with Sam and his classmates flying to New York to take part in a quiz. It is scientists we see re-evaluating the impacts of climate change, and a politician who models self-re-evaluation, not 'ordinary' individuals. It is perhaps not surprising, then, that a study by Reusswig, Schwarzkopf, and Pohlenz (2004) revealed that German viewers agreed more strongly after seeing the film than beforehand that the government should play a big role in taking action on climate change, but it had a negligible influence on views about the role of individuals. Similarly, Beattie, Sale, and McGuire (2011) found that one clip from *An Inconvenient Truth*, which emphasises the contribution of China to global warming, led to an increase in 'shifting responsibility' for action on climate change from self to others.

Self-liberation was a feature of some of the films, particularly *Just Do It*, but this perhaps needs to be emphasised more, as according to the TTM it is the pivotal process that occurs between thinking about change and actually beginning it. Self-liberation involves believing that one can make necessary changes. Interestingly, individuals who were shown clips from *An Inconvenient Truth* agreed more strongly afterwards with statements such as "I can personally help reduce climate change" and "I feel empowered in the fight against climate change" even when the clips were not positive (Beattie, Sale, and McGuire, 2011). However, this study did not test whether participants felt increased efficacy in relation to specific actions, nor whether they planned (or took) any action.

In addition to the confidence individuals feel that they can change their behaviour and maintain changes, another aspect of efficacy is belief that changes made will be effective in overcoming the problem, and this is something climate change films can encourage. For example, *Just Do It* gives information at the end of the film about the apparent success of some of the campaigns featured. It is worth stressing the advantages of acting together, as *Just Do It* does; groups can provide many benefits, including moral support, shared learning, and accountability (Howell, 2009) and can therefore build capacity and effect more change (Middlemiss and Parrish, 2010; Staats, Harland, and Wilke, 2004).

By their nature, films generally employ or involve cognitive/affective processes; they are not suitable vehicles for behavioural processes such as contingency management. However, some of the films analysed did show behavioural processes in action. Filmmakers keen to stimulate action could give more attention to portraying the variety of processes that help to support and maintain behavioural change.

The TTM suggests that the fact that films employ and depict more cognitive/affective than behavioural processes of change makes them more appropriate 'interventions' to use with audiences at earlier stages of change. It is difficult to know whether climate change films gain such audiences, as no studies have directly assessed viewers' stage of change, but some studies include information

that can perhaps be used as proxy measures. For example, Howell (2011) found that in the year prior to seeing *The Age of Stupid*, 61.8% of viewers sampled had donated money to, and 36.1% were actively involved in, groups campaigning about climate change. Furthermore, respondents later reported several actions they were doing but not because of having seen the film. These results suggest that many viewers of that film could have been at the action or even maintenance stage for some lower-carbon behaviours. Akter and Bennett (2011) discovered that Australians who had seen *An Inconvenient Truth* were significantly more likely to report having reduced their use of motorized vehicles and/or electricity than non-viewers, and claim that the film influenced behaviour, but the study appears to show correlation rather than causality and it seems equally likely that people already engaged in climate change mitigation action are more likely to see the movie than those who are not. Individuals who saw it at a free showing organised by an NGO in the USA exhibited high levels of belief in climate change and motivation to act beforehand (Nolan, 2010). The film has, however, been incorporated into the school curriculum in several countries (Climate Crisis, undated), which makes it likely it will be seen by children at a range of stages of change with respect to lower-carbon behaviours.

An E-E format, embedding information and behavioural role models in serial dramas not perceived to be primarily about climate change, might reach a wider and more appropriate audience than climate change movies, avoiding problems of avoidance and reactance. However, this could be difficult to arrange as climate change is a controversial topic and broadcasters are wary of controversy, especially in media-saturated commercial broadcasting environments – E-E programmes that have addressed controversial topics have tended to air in developing countries where there is less media saturation (Singhal and Rogers, 2004). Instead, filmmakers could learn from E-E and focus more on embedding intended persuasive content in enjoyable movies rather than making the messages overt.

Being primarily a summer entertainment movie, *The Day After Tomorrow* is more similar to E-E programmes than the documentary films studied here. It thus seems likely to attract a different audience, and indeed UK viewers of this movie did not seem particularly concerned about climate change beforehand (Balmford et al., 2004; Lowe et al., 2006). They therefore might have been at earlier stages of change, so the TTM would suggest that the processes of change it employs should work well with this audience. However, Lowe et al. (2006) found a decrease in viewers' evaluation of the likelihood that they would experience climate change impacts in their own lifetime. This is important because people are less likely to respond to a threat if they do not feel personally vulnerable (Das, de Wit, and Stroebe, 2003). Other studies also found a decrease among viewers in the perceived likelihood of climate change (Lowe, 2006; Reusswig, Schwarzkopf, and Pohlenz, 2004) or less realistic expectations of climate change impacts than people who hadn't seen the film (Balmford et al., 2004). This may be due to the fact that the movie sacrificed realism for dramatic effect; in TTM terms, it concentrated on dramatic relief at the expense of consciousness-raising. The film did increase concern about climate change (Balmford et al., 2004; Leiserowitz, 2004; Lowe et al., 2006) but a study that included a later follow-up found that this was short-lived and viewers did not know what to do (Lowe et al., 2006). This demonstrates the necessity of teaming emotional engagement with solution messages (dramatic relief with consciousness-raising), as in E-E. Leiserowitz (2004) and Lowe et al. (2006) found respondents were more likely to express intentions to take climate change mitigation actions having seen *The Day After Tomorrow*; Balmford et al. (2004) found no change in the number of emission-reducing activities people planned to undertake.

According to the model, evaluation of the efficacy of climate change films need not depend on whether individuals actually change their behaviour. Indeed, those that utilise primarily cognitive/affective processes of change should be expected to encourage early stage progression, rather than behavioural change. Nolan (2010) found that *An Inconvenient Truth* inspired little concrete action among students who were recruited to watch it and who did not display high levels of concern about climate change beforehand, but the film did increase concern and motivation to act immediately afterwards. This might be evidence of progression from precontemplation to

contemplation, or from contemplation to preparation, among an audience who were at early stages of change. The finding that viewers often do not act on the increased motivation or behavioural intentions prompted by climate change films (Howell, 2011; Lowe et al., 2006; Nolan, 2010) suggests that films need to be coupled with other interventions if they are to help people progress from contemplation to action. Armitage et al.(2004) suggest the use of implementation interventions (Gollwitzer, 1993); public commitments such as pledges may also be useful (Cobern et al., 1995; Schultz, Oskamp, and Mainieri, 1995).

The Day After Tomorrow, *An Inconvenient Truth*, and *The Age of Stupid* essentially point out the cons of *not* taking action; films may need to focus more on positive framing in order to influence decisional balance. *Just Do It* portrays several benefits of involvement in direct action campaigns: camaraderie, empowerment, and campaign successes, although some viewers will likely evaluate the cons of conflict and arrest as outweighing these pros.

In contrast to *An Inconvenient Truth* and *The Age of Stupid*, *Just Do It* takes audience acceptance of the problem for granted. This kind of film therefore appears more suitable, according to the TTM, for the kind of audience likely to voluntarily watch documentaries related to climate change, who already evidence a high level of concern (Howell, 2011). Having said that, it should be noted that Rosen (2000) found that for some health behaviours, cognitive/affective processes were used at all stages of change. He argues that when taking up healthy behaviours, individuals "must continually reinitiate a new behavior and may be helped by continuing to think about the benefits" (Rosen, 2000, p.602). Even for people who may have reached later stages of change, films such as *The Age of Stupid* can provide reinforcement and moral support (Howell, 2011), thus helping prevent 'relapse'.

In reality, climate change films are likely to be able to encourage behavioural change only to a certain extent, unless there are changes to the social context within which individuals act (Corraliza and Berenguer, 2000; Young and Middlemiss, 2012). This implies that social liberation is essential (and thus worth films promoting; Ockwell, Whitmarsh, and O'Neill (2009) propose that a particular role for climate change communications is in getting people to accept and demand regulation). Prochaska (1994) suggests that to facilitate action, the increase required in the evaluation of pros of change is so large that it may well be necessary to apply both individual change processes (to increase *perceived* pros of making a change) and policies to change the *actual* pros. One limitation of the TTM in the context of pro-environmental behaviours is that it pays little attention to the power of social norms (Schultz et al., 2007). The need to challenge dominant norms (e.g. around consumerism) to achieve sustainability can perhaps be seen as part of social liberation, but this idea arguably needs to be developed further in the model.

6 Conclusions

This paper has demonstrated the potential of using the TTM to provide insights into the promotion of pro-environmental behaviour. Analysis of climate change films using the model suggests that they can play a part in encouraging individuals to take climate change mitigation action through employing and modelling several processes of change. Films are particularly suitable vehicles for consciousness-raising and dramatic relief, and therefore might most usefully promote change – which may be a change in attitudes (progression from precontemplation to contemplation, and re-evaluation of the pros and cons of change) – among viewers at earlier stages of change. The challenge is for films to attract such audiences. Embedding climate change themes in 'ordinary' movies has potential, but these should contain realistic depictions of the issue to provide accurate information, and show how 'people like me' can tackle the problem, to promote engagement and self-efficacy. Filmmakers who wish to encourage actual action, rather than early-stage progression, should consider portraying behavioural processes of change. Consciousness-raising and dramatic relief may help to reinforce behavioural change among audiences who are already taking action. However, a film on its own is unlikely to achieve significant and widespread climate change

mitigation action, given the number of factors that affect behaviour, so it is advisable to consider how movies can be teamed with other interventions.

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Table 1: Stages of change as defined by the transtheoretical model

Stage	Definition
Precontemplation	No intention to change behaviour in the foreseeable future (usually measured as the next six months). Individuals may be unaware or under-aware of problem behaviours, or have tried to change but relapsed.
Contemplation	Thinking about changing behaviour (often measured as seriously considering action within the next six months), but not committed to action now. Weighing up pros and cons of current situation and of change.
Preparation	Intending to take action in the near future (usually measured as the next month) and preparing to do so. Small behaviour changes may already have been made.
Action	Behaviour changes (usually measured according to some specific criteria) have been achieved for up to six months.
Maintenance	Behaviour changes have been maintained for more than six months. Not a static stage as individuals still need to work to prevent relapse.
Termination	New behaviour has become habitual; no temptation to relapse. 'Termination' is not always a practical reality – for some behaviours, a lifetime of maintenance is realistic. This stage is often not mentioned.

Sources: Based on information from Prochaska, DiClemente, and Norcross (1992) and Prochaska and Velicer (1997).

Table 2: Processes of change as defined by the transtheoretical model

Process	Definition	Example interventions/techniques
Cognitive/affective processes		
Consciousness-raising	Increasing awareness about problem behaviour (causes, effects, solutions)	Education, media campaigns, feedback, *articles about climate science*
Dramatic relief	Being moved emotionally with regards to the problem	Role play, personal testimonies, media campaigns, *vivid images of suffering*
Environmental re-evaluation	Assessing how one's behaviour affects social/physical environment	Empathy training, family interventions, *ecological footprinting*
Self-re-evaluation	Assessing how one thinks and feels about oneself with regard to problem behaviour	Value clarification, healthy role models, imagery, *'green values' questionnaires*
Self-liberation	Belief that one can change and commitment to do so	New Year's resolutions, public pledges, *adopting an annual 'carbon ration'*
Behavioural processes		
Contingency/reinforcement management	Instating consequences for behaviour – costs and/or rewards	Self-reward, contingency contracts, group recognition, *carbon taxation*
Helping relationships	Open, trusting relationships with others who support behaviour change	Self-help groups, buddy systems, *Carbon Conversations*[a]
Counter-conditioning	(Learning and) substituting alternatives for problem behaviour	Depends on problem behaviour, *e.g. cycling/walking instead of driving*
Stimulus control	Removing cues for undesired habits; adding prompts for desired ones	Avoidance, restructuring environment, *"switch off" stickers on light switches*
Social liberation	Increase opportunities available in society/alternatives to problem behaviour	Advocacy, empowerment, policy interventions, *improve public transport*

Source: Based on information from Prochaska and Velicer (1997), with sustainability-specific examples by author in italics.
[a]Carbon Conversations: six meetings about climate change and carbon reduction (Randall, 2009)

Table 3: Processes of change matched with stages of change[a]

Precontemplation	Contemplation	Preparation	Action	Maintenance
Consciousness-raising				
Dramatic relief				
Environmental re-evaluation				
	Self-re-evaluation			
		Self-liberation		
			Contingency management	
			Helping relationships	
			Counter-conditioning	
			Stimulus control	

[a] The process of 'social liberation' is not included because it has been regarded as outside the remit of the health behaviour programs from which the model was developed.
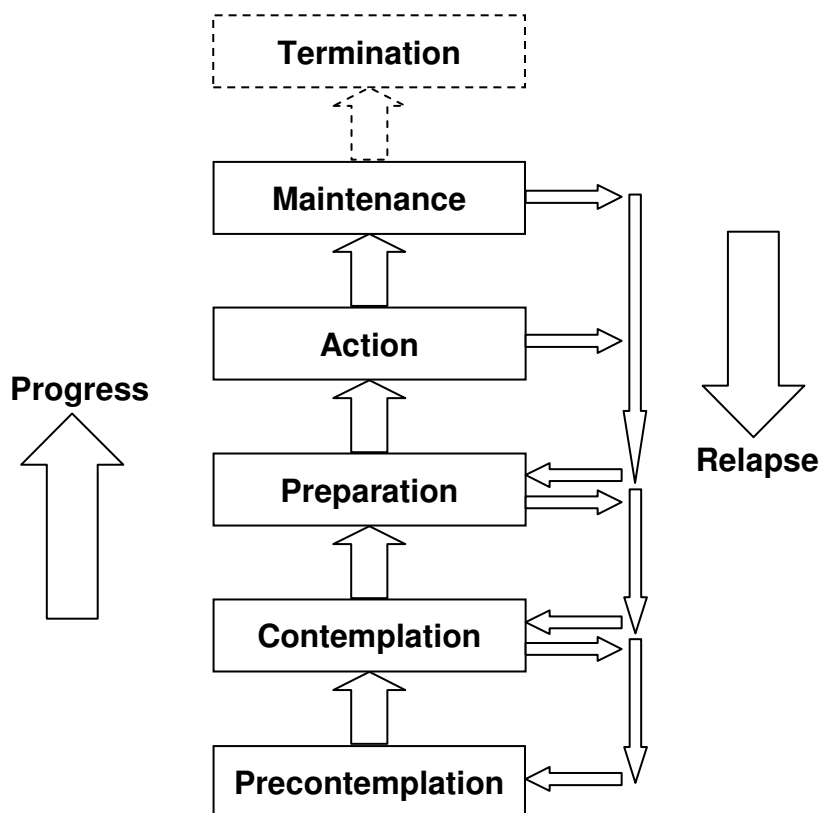*Source*: Prochaska and Velicer (1997). Used by permission.

Figure 1: Progression through the stages of change
Source: Based on a diagram from Atkins (2009).