



Universidade do Minho
Instituto de Ciências Sociais

Centro de Estudos de Comunicação e Sociedade
www.cecs.uminho.pt

**Reading the papers. Ideological cultures and
media discourses on scientific knowledge ***

Anabela Carvalho

Professora Auxiliar

carvalho@ics.uminho.pt

Universidade do Minho
Centro de Estudos de Comunicação e Sociedade
Campus de Gualtar
4710-057 Braga
Portugal

* CARVALHO, A. (2003) "Reading the papers. Ideological cultures and media discourses on scientific knowledge", paper presented at a conference entitled "Does Discourse Matter? Discourse, Power and Institutions in the Sustainability Transition", Hamburg, Germany 11-13 July

Abstract:

Climate change is a contested issue at the scientific, political, economic and social levels. The media are a central arena for such a debate. As a marketplace of arguments, the media promote some claims, ideas and voices while suppressing others.

The paper will argue that the discursive (re)construction of the sciences of climate change in the media is strongly entangled with ideological standpoints. Understood as a set of ideas and values that legitimate a programme of action vis-à-vis a given social and political order, ideology works as a powerful selection device in deciding what is scientific news, i.e. what the relevant ‘facts’ are. Ideology also shapes the discursive construction of uncertainty and narrativizations of the future.

The above-mentioned claims are based on extensive analysis of press coverage of climate change, possibly the most serious environmental threat we are facing. Departing from a database of around 2500 articles published in the *Guardian*, *The Independent* and *The Times* between 1985 and 1997, I have examined those news texts that fall into ‘critical discourse moments’ in the constitution of climate change as a political and public problem.

The theo-methodological orientation is mainly inspired by Critical Discourse Analysis. The analytical framework has a textual and a contextual components. At the textual level, emphasis is given to morphological characteristics and structural organization of texts; objects of discourse; actors; language and rhetoric; discursive strategies; and ideological standpoints, while the contextual analysis runs along two axis: comparative-synchronic (simultaneous depictions of the issue in different newspapers) and historical-diachronic (temporal sequences and evolutions).

The paper will show that there are profound differences across newspapers and among journalists in the depiction of the sciences of climate change, and how this both results from and (re)produces particular ideological views. The representation of scientific knowledge has important implications for evaluating political programmes and assessing the responsibility of both governments and the public in addressing climate change.

Keywords: climate change; discourse; media; science; ideology

1. Introduction

For a long time have we known that emissions generated by transportation, industry and domestic uses of energy are responsible for a rise in the concentration of carbon dioxide and other greenhouse gases in the atmosphere. In the last few decades, scientific research in various disciplines has come to conclude that there is a link between this enhanced greenhouse effect and changes in climate patterns, such as the increase in average temperature, higher instability and more frequent occurrence of extreme weather events. Such claim is nowadays widely accepted in the scientific community with only a small minority of ‘sceptics’ refuting it. The Intergovernmental Panel on Climate Change (IPCC) aggregates some of the best scientists in relevant fields and regularly reviews scientific progress around the world to produce scientific reports which are expected to inform international policy.

Climate change presents great challenges to modern societies. Addressing the problem in a scale that may prevent its worst consequences requires coordinated action across several domains of life. Effective policies are likely to demand changes from corporations and from citizens, together with a more interventionist state. In a variety of institutions, resilient power structures may be at stake. Governmental regulations of economic activity for limiting emissions through taxation or other controls may be deemed necessary. Lifestyles characterized by consumerism and heavy car use may have to be sanctioned.

The worth of nature as we know it, individual rights and freedoms, mobility and the well-being of distant others are some of the issues that are assessed differently by a wide number of social groups, institutions, interested individuals and political agents. Crucially, also, policies for reducing climate change are viewed by some as a threat to economic growth. Alternatively, they are perceived as a stimulus for economic renovation by others.

Many aspects of climate change politics are thus heavily contested. In the social circulation of the meanings associated with this issue, the media are a central arena or a sort of marketplace for arguments. Particular values and worldviews are produced, reproduced and transformed in media discourses. Others are excluded from them. This paper will focus

on the scientific dimension of climate change and unpack the standpoints that are dominant in the British broadsheet newspapers.

2. Science, ideology and the media

Studies of the relation of science and the media were for long dominated by a 'transmissional' notion of communication. The 'canonical view', typically conceptualising science communication as 'popularization', was centred on issues of quantity and rigour: how much scientific knowledge was reported in the media and how accurately (cf. Bucchi, 1998). Efficiency in the flow of data seemed to be the main goal. Some researchers also looked at the relation between media reporting and public knowledge about an issue. The conveyor belt proposition is again in evidence here. In the field of climate change, several works conform, in one way or the other, to that logic (Kempton, 1991; Bell, 1994; Wilson, 2000).

In recent decades, research has become more sophisticated. Awareness of the media's transformative logics and mechanisms has led to investigation of the news values in operation in science reporting, representations of risk associated to environmental issues, as well as the multiple modes of consumption of mediated meanings of science and the environment (e.g. Burgess et al., 1991; Hansen, 1994; Allan et al., 2000). As the constitutive role of language became clearer, attention turned to the discursive processes involved in the management of science and policy (e.g. Hajer, 1995).

As a forum for the discourses of others and a speaker in their own right, the media have a key part in the production and transformation of meanings. The notion of science as an 'ivory tower', exempt from public exposure and debate, is increasingly inadequate. As our 'risk society' (Beck, 1992) generates new problems which require scientific interpretation but affect us all (e.g. genetically modified organisms, depletion of the ozone layer, climate change), science is asked to 'come out to the street' and to be the basis of policy decisions. The media are important in the mediation of these 'relations of definition' (Beck, 1992) between the science, the public and the political spheres.

Gamson (1999) suggests that the media can be an important 'validator' of science.

Considering facts as ‘institutionally validated claims about the world’, Gamson argues that social institutions with the capability to bestow facticity on claims in a given realm are the ‘primary validators’. An example is the IPCC in the field of climate change. Media act as ‘secondary validators’ by reporting on and diffusing the factual claims of ‘primary validators’. But the media also act as ‘primary validators’ in certain cases. In controversial issues, their gatekeeping role is more important as they decide which ‘would-be primary validators will be given voice, and how much of a voice’ (Gamson, 1999: 27).

Nevertheless, in the media, as in other arenas, there is no such thing as ‘pure facts’. Instead, ‘truth claims’ are embedded with certain worldviews, judgements and preferences. A number of analyses of the representation of social and political matters in the media have indicated that there are significant ideological factors in play (Hall et al., 1978; van Dijk, 1991; Fairclough, 1995). However, the role of ideology in media representations of science is blatantly under-researched. To what extent do media readings of scientific knowledge and evaluations about the worthiness, accuracy and interest of scientific ‘facts’ depend on normative and axiological issues? How does science reporting relate to political standings in the media? What explains differences in science reporting amongst newspapers with broadly the same quality journalism? This paper aims at filling this gap and questioning the role of values and idea(l)s in the press’s discursive reconstitution of science.

After the proclaimed ‘end of history’ and ‘death of ideology’, there is now a revived interest in ideological issues. Still, the field remains contentious, with the very concept of ideology being subjected to multiple definitions (Eagleton, 1991). In the Marxist tradition, ideology has often been linked to social domination and to distortion of reality. Alternatively, I understand ideology as a system of values, norms, and political preferences, linked to a programme of action vis-à-vis a given social and political order. People relate to each other and to the world on the basis of value judgments, ideas about how things should be, and preferred forms of governance of the world. In other words, ideologies are axiological, normative and political. Besides government and society, the referents of ideologies may include, for example, the economy and the relations between man and the environment. Ideologies always involve a vision of an ideal world with which

lived existence is confronted. They therefore legitimate ‘action for the preservation, reform, destruction and reconstruction of a given order’ (Seliger, 1977: 119-20).

Lull (1995) claims that the strength of ideology depends on its communication. I view media discourse and ideology as mutually constitutive. On the one hand, media texts result from ideological standpoints. On the other hand, media texts produce ideology: news and other media genres always reproduce and/or challenge a certain ideology. The media should not be seen as mere conveyers of the ideologies of other actors. Besides allowing or disallowing other social actors to advance their ideological standings, the media can also have an important agency in bringing in new ideological readings of issues or confronting those of the dominant.

What ideological issues are interplayed in the discursive construction of scientific knowledge on climate change in the British ‘quality’ press? This is the question that will drive the discussion below.

3. Climate change sciences in the British press

The paper will focus on the varied representations of climate change in three British ‘quality’ newspapers - the *Guardian* (and the Sunday broadsheet *Observer*), the *Independent* (including the *Independent on Sunday*) and the *Times* (including the *Sunday Times*). The choice of these newspapers results from the interest in examining, as fully as possible, the arguments and perspectives of various social actors on climate change. Such a debate on this complex issue is excessively simplified or excluded in other media. Furthermore, the selected newspapers have an important power of agenda-setting for the public and the other media. Finally, they are preferred by politicians and other decision-makers and therefore their discourse matters even more (see Sparks, 1987). These newspapers span over the political spectrum. The *Times* is a Conservative paper, committed to the ‘establishment’ and to the sovereignty of traditional institutions. In this group of newspapers, the *Guardian* is the only one that is not owned by a conglomerate and

the most leftist. The youngest of the three, the *Independent* leans towards the Labour Party but often oscillates somewhat to the right.

The period covered by the analysis is 1985, when the issue started rising to political attention, although incipiently, to 1997, the year of the Kyoto Protocol. Excluding passing references to climate change, 2310 articles appeared in the three newspapers in this time interval. I chose to undertake a detailed discourse analysis of all the articles published from 1985 to the end of 1988, when attention to the issue started escalating, and, from there onwards, to focus on ‘critical discourse moments’ that could bring challenges to discursive constructions of the issue. Those moments are clearly indicated below.

The analytical framework employed in this project departed mainly from Critical Discourse Analysis (van Dijk, 1988; Fairclough, 1995; Wodak et al., 1999). It operates at the textual and contextual levels. In the text, attention is given to morphological characteristics and structural organization of texts; objects of discourse; actors; language and rhetoric; discursive strategies; and ideological standpoints. Contextually, the analysis below will focus on a comparative-synchronic axis (simultaneous depictions of the climate change in different newspapers) and a historical-diachronic axis (temporal sequences and evolutions).

3.1. 1985-1988: The constitution of the greenhouse effect into a political issue

The earlier years of reporting on climate change tell a known story about media discourse on science: a novel knowledge claim is reconstituted in the press in a way that reinforces the social power of science. An image of certainty was clearly built by the *Times* and, in a lesser degree, also by the *Guardian*¹. Linguistic choices such as the word ‘will’ for talking about impacts forecasted by scientists², the use of terms such as ‘detailed and reliable records’³, and the recurrent employment of the word ‘show’ in relation to records or results⁴ contributed to depicting climate sciences as a consensual and reliable domain.

¹ The *Guardian* occasionally acknowledged the existence of some tensions within climate studies.

² ‘How greenhouse effect might help cyclones to grow’, John Newell, *Times*, 20.04.87.

³ ‘Gloom over weather patterns’, Pearce Wright, *Times*, 13.08.85.

⁴ ‘Gases pushing up ground-level temperatures’, Pearce Wright, *Times*, 21.01.86.

Scientists were the uncontested central actors and exclusive definers of climate change up to the end of 1988 (cf. Trumbo, 1996). Newspapers deployed a discursive strategy of authorization (van Leeuwen and Wodak, 1999): authors of press articles sought to legitimate knowledge claims by resorting to the authority of individuals and institutions holding positions of recognized importance. The scientific journals *Science* and *Nature* were the sources of six out of 21 articles published between 1985 and 1987 in the *Guardian* and *Times*. The names of researchers and their institutional affiliation were referred in 20 articles. At a higher level, we can speak of a strategy of rationalization: climate change was represented as a tractable and potentially solvable scientific problem, to be dealt with by credible agents.

Respect for science and scientists is a socially widespread value that is clearly in evidence in the press in this period (see Irwin, 1995). The representation of climate change described above both departs from and strengthens the authority of science. However, mediations of climate change up to this moment did not raise any challenges for ingrained habits and dominant institutions. In fact, in this period, the press clearly underestimated the risks associated to climate change, and refrained from presenting its possible consequences. In a similar vein, newspapers remained silent about responsibility for the problem, not only leaving unquestioned the economic and social practices that generate greenhouse gases but also omitting references to the role of political institutions.

The rapport between the media and science started changing at the end of 1988. This was the time when Margaret Thatcher appropriated climate change to promote nuclear energy, dismantle the coal industry and help the privatisation of electricity (Carvalho, 2002; 2003). Climate change thus became quite prominent in the political and media agendas, pushed by the Conservative government but also by environmental organizations and political forces in opposition who demanded solutions that contrasted with the government's. Scientists also saw in public attention to climate change a possibility for enhanced funding and empowerment. The greenhouse effect was henceforth often narrativized as a threat, a large risk for human security.

The *Guardian* and the *Independent* were the stages for a strong wave of contestation of the government's proposals for addressing the problem of greenhouse gas emissions. With

some neo-liberal views in the *Independent* as the exception, these two papers mobilized concern with scenarios of a vastly transformed greenhouse world but advanced alternative solutions for the problem, like investment in renewable energies and public transport. The scope of potentially necessary political, social and economic transformations started to become visible.

Then, the *Times*' deference for science gave way to scepticism. The newspaper started casting doubts and calling for proof of scientific claims. In 'The final forecast?: The world's weather', Brian James (11.11.88) maintained that 'when challenged by the decision-makers (which is science-speak for politicians who will have to introduce unpopular legislation and industrialists who must finance eco-sane alternatives), the climatologists lack all proof.' A similar discourse is found in 'Taking the heat off the planet' (Jane Bird, 23.10.88) and 'Britain joins global project' (Robert Matthews, 28.10.88).

This discursive shift does not mean that there was a transformation in the ideological stances that are dominant in the *Times*. It just suggests that in the hierarchy of values subscribed by the newspaper, scientific authority ranks below Conservatism, the preference for a non-regulatory government and reinforcement of the social and economic status quo. In this ideological constellation techno-science is subjected to other ideological referents, like politics and economics. Ironically, it was when political power turned to climate change that the *Times* started adopting a suspicious attitude towards science. This tensely coexisted with a sensationalist dramatization of climate change⁵. Typically, the newspaper displayed a double allegiance – to the Conservative government in power and to the stability of economic and social structures. But when an issue heightened by the government started posing challenges to the status quo, the *Times* championed the latter.

⁵ E.g.: 'Can we stop Britain drowning. Flood warning', Peter Davenport and John Young, 21.10.88; 'Upheaval to climate 'imminent'', Robert Matthews, 14.11.88.

3.2. 1990: The first IPCC report

The publication of the first report of the Intergovernmental Panel on Climate Change (IPCC) in May 1990 should have been a key moment in the discursive construction of the greenhouse effect. Adjoining some of the top climate scientists around the world, the IPCC's report represented the consensual knowledge that could form the basis for policy decisions. Nevertheless, at this time, climate studies were still characterized by a large degree of uncertainty. Uncertainty is a difficult issue for reporters, as news values of clearness and unambiguity demand 'facts' and lead to a streamlined image of scientific knowledge (cf. Nelkin, 1987; 1991).

In the field of climate change, uncertainty permits varying prognostics, which are fundamental for decision-making. Definitive evidence of the full impact of human-generated greenhouse emissions may come too late to avoid the worst effects. Crucial judgments thus have to be made in which the short and the long-terms may be in tension. The illations the media draw from uncertainty are profoundly ideological. In climate change there is a great risk for future generations, for nature, and for geographically distant people, amongst other examples. It is the worth attributed to those realities and the values that may be at stake, like freedom, equity and responsibility that may justify action or inaction.

Both in 'Climate crisis report throws down gauntlet' (Paul Brown) and 'Environment: Heat and dust-ups' (Nigel Williams), printed on 25.05.90, the *Guardian* acknowledged the existence of uncertainty. Yet, calls for high cuts in emissions are to be found in these texts. Support for a precautionary approach to climate change was to remain constant in the *Guardian* throughout time. Therefore, as Margaret Thatcher proposed stabilization of emissions by 2005 as the British target, the *Guardian* led a campaign of contestation where the scientists' claims of a necessary 60% reduction in emissions were often evoked⁶.

⁶ 'Climate pledge 'too little too late'', Paul Brown and Nigel Williams, 26.05.90; 'Climate: Following Mrs Thatcher's recognition of the threat of global warming, Environment *Guardian* asked for practical solutions that she might encourage', Andrew Warren, 01.06.90.

In the *Times*, the launch of IPCC report was dominated by Thatcher's attempt to appropriate climate change. The IPCC claims were mainly read in conformity with Thatcher's propositions. However, as attention to climate change was heightened, the *Sunday Times* revealed a very reactionary attitude in three articles from 27.05.90: 'Green hysteria sets red alarm bells ringing' by David Sapsted; 'Global Fawning. Global Warming' by Bryan Appleyard; and 'Greenhousemongers' (Leading Article, unattributed). Environmentalism is labelled as 'religious dogma', 'sentimental ululation' and 'green Stalinism'.

The words below are typical of a Promethean perspective of man's relations with nature (Dryzek, 1997).

... a belief in the curiosity and audacity which have always driven mankind on towards new horizons. The latest new horizon, thanks to the Hubble space telescope, is hundreds of light years away. ... perhaps, instead of bending down to look at the oil slick or the cracked concrete at our feet, we should be stretching upwards and looking outwards to the stars.

Like the Greek Titan Prometheus who stole the fire from Zeus and gave it to humans, in this view man has infinite possibilities in its relation to the environment. Economic growth and progress are unlimited⁷.

The greenhouse effect was classified as the 'latest scientific faddism' and the 'greenhousemongers' discredited ('Greenhousemongers', 27.05.90). The *Sunday Times* attempted to contradict mainstream scientific claims and argued that 'scientists are deeply divided about how much global warming will result from an increase in greenhouse gases' (ibidem). This discursive construction suggested that the scientific community was split in the middle about this issue when, in fact, disagreement with the IPCC was very minoritarian.

In 'Greenhousemongers 2' (unattributed, 03.06.90) the *Sunday Times* expressed fears that 'in a fit of excessive and emotional environmentalism, governments could squander billions that might be better spent elsewhere'. Under the argument of a 'hard-headed

⁷ Contrast this stance with the survivalist discourse of Nigel Fountain in 'Echoes of disaster for this island Earth', *Guardian*, 30.05.90.

examination' (27.05.90) and a sensible, rational and pragmatic position, there was resistance to government intervention in relation to climate change. Values like individualism and market liberalism came through in the text.

In a free society the correct course is not to ban people from using cars ... There is a clear need to develop a set of mechanisms to make markets work better to reduce pollution.

In contrast, empathy with geographically distant peoples or a sense of global responsibility was absent from the *Times*:

Bangladesh may be in great danger from flooding in the next century; but the greenhouse effect could also bring huge benefits to farming in Canada and the Soviet Union, allowing them to support far greater populations. Mass migration is a common event in world history, and it might make more sense to live with some of the consequences of the greenhouse effect than to devote effort and resources to trying to thwart them.

In the *Independent*, several representations of the IPCC report created a sense of danger: 'Scientists identify growing danger of global warming' (unattributed, 26.05.90) and 'The greenhouse time bomb: Authors of UN report say new data shows they have underestimated dangers of global warming' (Steve Connor, 27.05.90).

Quite critical of Thatcher's proposals, Nicholas Schoon used 'expert' knowledge to claim for stronger governmental action on greenhouse gases ('Experts say the world must be led by example', 26.05.90, page 3). And the *Independent* advocated precautionary action in an editorial headlined 'Progress and the environment' (26.05.90). The newspaper tried to harmonize environmental protection with 'progress': 'A concern for the environment tends to improve the quality of life and of investment, rather than acting as a drag on progress.'

A general discursive transformation is worth noting here. By 1990, science had lost most of the initial high ground in definitions of the greenhouse effect in the press (cf. Trumbo, 1996). Governmental moves to control and recontextualize understandings of the

greenhouse effect led to most of media discourse being taken over by politicians and other actors.

3.3. 1995: The Berlin Summit and the second IPCC report

The IPCC's second assessment report was released in December 1995. For the first time, it stated clearly that human activities have an impact on climate: 'the balance of evidence suggests a discernible human influence on global climate' (IPCC, 1996). It also promoted substantial mitigation measures. Prior to the IPCC report, it is worth looking at media reconstructions of science around the time of the First Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC)⁸ that took place in Berlin in March 1995. The stabilization of emissions by 1990 levels agreed in Rio had been shown to be insufficient and the summit had a mandate to define quantified reduction objectives.

Analysis of science reports in the press in 1995 indicates that strong ideological filters were in place in the three newspapers. At a time when scientific knowledge on climate change was becoming more solid and consensual, an image of uncertainty and disagreement was amplified by the *Times* and by some in the *Independent*.

The selection newspapers make of scientists as 'authorized definers' of climate change is very suggestive. The *Times* opted to give space to some of the most outspoken American 'sceptics' in 1995. These scientists are known to have economic ties to fossil fuel companies and/or institutional commitments to Republican bodies (see Gelbspan, 1997). In a lengthy article appearing on the prominent page 3 (continued on 6), entitled 'Global warming: why scientists are feeling the heat' (26.03.95), the *Sunday Times*' Sean Ryan finishes his somewhat ambiguous reasoning on the science of climate change and the need for action with the following words:

⁸ The UNFCCC had been signed at the Rio conference in 1992 and set the basis for internationally concerted policies to address the greenhouse effect.

Lindzen fears the Berlin summit could set governments on a course that would be wrong but legally unalterable before the year 2010. “If science in a few years can no longer sustain these forecasts, nothing will stop the policy. They are deciding what the policy will be regardless of the science.”

This discursive construction of the problem enhances uncertainty and presents politics as dangerous, at least the kind of politics that was being decided in Berlin. What appears to be at stake here is the role of regulatory policies by governments or intergovernmental bodies towards which the *Times* is generally mistrusting.

The same article illustrates the striking differences between newspapers in interpreting the standings of scientists, in the case the chair of the IPCC’s Working Group I.

Sir John Houghton ... *frankly acknowledges the uncertainties*. The IPCC predicts warming of at least 0.2C a decade endorsed by 400 scientists *but he admits*⁹: “We’re not saying we’ve seen it because the signal is still hidden somewhat in the noise. We are feeling more confident that we might be there.”

In what context were Houghton’s words uttered? Was there an interpellation of the journalist that motivated this answer? And should we see in Houghton’s words a basis for postponing action or simply an indication that the climate sciences, like all others, operate within certain limits of certainty? The words of Houghton in the *Guardian* (‘Global warming summit at risk’, Paul Brown, 25.03.95) clarify where he stood.

“There is no doubt that global warming is happening. It is inevitable. The question is whether we can slow it down enough to avert the worst effects.”

Other articles in the *Guardian* sustained this re-construction of Houghton’s views¹⁰.

Throughout the year of 1995, the *Times* carried several texts that denied or cast doubts on the greenhouse effect, or on its causal relation to human practices. Such texts were signed by William Burroughs¹¹ and by Nigel Hawkes¹². Hawkes was the science editor of

⁹ Emphasis added.

¹⁰ ‘Our man in the greenhouse’, Paul Brown, 29.03.95; ‘Heat is on to stop the slow thaw’, Polly Ghazi, *Observer*, 26.03.95.

¹¹ ‘A climate of confusion’, 27.03.95; ‘The clouds part on a mystery’, 10.07.95. Burroughs authored several other articles for the *Times*, in the same vein, from 1987 to 1996.

the *Times* and therefore had a big responsibility in defining interpretative lines for climate change. When he did not dismiss the greenhouse effect, he advanced some Promethean, technical-fix-type solutions to solve it, such as damping enormous amounts of iron in the oceans¹³ and undertaking a massive plantation of trees¹⁴. Yet, there were a number of articles in the *Times* that referred to indicators of climate change. They were all authored by environment correspondent Nick Nuttall¹⁵. Moreover, Nuttall often made the connection between climate change and human activity¹⁶.

The scarcity of articles addressing the IPCC's second assessment report is the first indicator of the relative devaluation that the *Times* made of the event. Even more telling is the fact that two of the three articles on the topic rejected the validity of the IPCC's claims. In 'The heat of argument' (30.10.95), Nigel Hawkes stated: 'An apocalyptic vision was conjured up last week in a new report issued by the ... IPCC... Vast areas will flood, people may starve, glaciers will melt and deserts expand as a result of global warming...'. The headline, the word 'conjured' and the irony in this opening paragraph produced a highly derogatory image of the IPCC. As climate change rose in the international political agenda, and the need for significant transformations in policies and the economy became more widely accepted, the *Times* vividly refuted the authority of science and promoted an attitude of suspicion and mistrust with regard to scientists. Patrick Michaels, of the University of Virginia, was another 'sceptic' enthroned by the *Times*¹⁷ in Hawkes' text. Michaels had been invited by the Institute of Economic Affairs, known for its right-wing views and for the promotion of economic liberalism, an ideology in sympathy within the

¹² 'Keeping cool', 17.04.95; 'Headache for the whales?', 19.06.95; 'New evidence proves that Antarctic ice is melting', 10.08.95; 'Astronomers are spot on', 28.08.95; and 'Warm water storm signal', 20.11.95.

¹³ 'A good dose of iron could halt global warming', 29.06.95.

¹⁴ 'Breathe easy', 28.08.95.

¹⁵ 'Wayward iceberg comes to a halt on seabed', 23.03.95; 'Arctic trees show signs of life as temperatures rise', 25.03.95; 'Geese ruin Arctic wetlands as climate change boosts flocks', 30.03.95; 'Rainfall pattern confirms climate fears', 31.03.95; 'Where are all our salmon?', 05.06.95; 'Scientists forecast tropical storms as Europe gets warmer', 21.09.95; 'Global warming tempts native butterflies north', 24.10.95.

¹⁶ 'Tree rings hold clue to the hottest news this century', 13.07.95.

¹⁷ Gelbspan (1997) describes the involvement of Patrick Michaels with the 'public relations apparatus' of the coal industry and how he has been heavily funded by fossil fuel interests.

Times. In a later article – ‘Mankind blamed for global warming’, 27.11.95 – Nigel Hawkes brought up contestation of the IPCC again.

Contrasting with the *Times*, the *Independent* advanced an image of scientific consensus with regard to climate change. This is immediately evident in the headline of a long feature from 15.10.95: ‘Global warming is leading to climatic upheaval, say scientists. Experts have reached consensus after years of disagreement’ by George Lean. In a similar vein, Nicholas Schoon authored an article entitled ‘Global warming is here, experts agree. Climate of fear: Old caution dropped as UN panel of scientists concur on danger posed by greenhouse gases’ (page 3, 30.11.95). Rhetorical strategies to reinforce scientific claims included discussing the pressures under which science is made, as Schoon spoke of ‘intense ‘opposition’ and of attempts to ‘water down’ the report. The IPCC’s reliability was also enhanced in ‘The right climate for tax on fuel’ (also by Nicholas Schoon, 16.10.95). Here, Schoon advanced support for potentially unpopular fuel taxes. However, he guarded against social injustice by advocating protection of the poor and elderly as well as jobs. The value of social solidarity was advanced as corrective of policy options derived from the knowledge claim that climate change is occurring and should be avoided.

Lean presented greenhouse emissions as a severe menace in the article mentioned above (15.10.95). The forecasted scenario was ‘as alarming as it could be for humanity’ and ‘global warming could accelerate out of control’, he warned. Nature can also be an ideological referent and here it is seen as fragile (cf. ‘myths of nature’-Schwarz and Thomson, 1990). A long-term perspective of the greenhouse effect was advanced in the front-page headline ‘Global warming ‘will last centuries’’ (George Lean, *Independent on Sunday*, 15.10.90). Such a reading is consistent with an ideology of sustainable development – a version in which future environmental security is highly valued.

Paradoxically, the *Independent* also made room for the views of the ‘sceptics’. In ‘Science ‘using language of the adman’ (Tom Wilkie, 01.12.95), Richard Lindzen discredited the IPCC by arguing that it produced ‘waffle statements which don’t say anything, which nobody can disagree with.’ The text attempted to dismiss claims of human

interference in climate change, maintaining that the registered warming fell within the limits of natural variability.

In summary, the *Independent* amplified quite different messages about the science of climate change, depending on who wrote the articles. Lean and Schoon, whose articles were in numerical majority over other authors, promoted the IPCC's reliability, emphasized the seriousness of the risk and called for action; discrepant voices cast doubts on the IPCC's report, and some attempted to deny or lessen the problem.

While in many of the previously discussed articles, ideological standings of newspapers were especially noticeable in issues related to the policy consequences of science, in other articles ideological standpoints were played at the very core of science. As it has global impacts, the analysis of climate change involves assumptions regarding societies with vary different levels of 'development' and calculations about the value of realities that may be affected or lost, including the value of human life. In the *Guardian*, a very long article by Richard Douthwaite 'Who says that life is cheap?' (01.11.95) focused on the valuation of human life in IPCC models, which are central to the scientific and policy-oriented reports this body produces. The IPCC had calculated the cost of lives by 'estimating how much people would be willing to pay to avoid a higher death rate or having their land flooded.'

As people in poor countries can't offer to pay very much, their deaths and the damages they will suffer were valued at much less than in wealthier countries, skewing the international distribution of the cost.

The value of equity is clearly at stake here. The *Guardian* advances a discursive construction that favours equality of treatment of all peoples. A similar debate and a sense of social responsibility had been advanced in the *Independent on Sunday* by Geoffrey Lean under the headline 'One Western life is worth 15 in the Third World, says UN report' (23.07.95).

In several articles, the *Guardian* constructed an image of crisis and a sense of urgency around climate change. The newspaper appeared clearly committed to mobilizing public concern by exposing the gravity of the problem. It spoke of a 'very great' 'danger', a

‘calamity’ and a ‘threat to the future of life on the planet’ in the articles mentioned below. The forecasts of the IPCC’s report were reported as certain: ‘The effects are real and we are feeling them. There is a great crisis ahead...Millions will die in storms, floods and droughts. Many more will lose their homes and their livelihoods.’ (‘World’s burning issue’, Paul Brown, 28.10.95). In this dramatization of the future there was care for the long term and care for the well-being of others. The value of responsibility is likely to have been a motive for this reading of science and got (re)produced in this discursive construction.

A sense of empathy with different peoples around the world was promoted in discussions of the effects of climate change from Switzerland to Southern Africa: ‘people may face starvation and ruin... the prospect of a refugee crisis is frightening.’¹⁸

For a group of island nations... [climate change] raises the prospect of disappearing beneath the waves during the next century. About 35 countries... will either be washed over completely or lose a large part of their land surface if the worst predictions come true. They are not alone in this problem. Parts of Europe, including much of Holland and eastern England, are threatened too. (‘Climate: A race against time’, Paul Brown, 05.12.95)

A notion of global connectedness was clearly present in Brown’s reconstitution of the IPCC report. By fostering the ‘experience of globality’ (Szerszynski and Toogood, 2000), the *Guardian* may be promoting a ‘global citizenship’ (ibidem). The public may feel more engaged with climate change and commitment to action may result from this ideological standpoint in media discourse.

Paul Brown also drew implications for policy-makers and the public: road traffic had to be reduced. Pointing to ‘carbon taxes’ and to ‘cutting down on car journeys’¹⁹ could be resisted by an editor as this could antagonise with readers’ wishes of individual freedom. But the *Guardian* stuck to its principles of socially-shared responsibility and defence of an interventionist state. ‘We must find different ways of generating electricity and so use less oil and coal. We must drive fewer petrol and diesel cars.’²⁰ is the common imperative presented elsewhere. The juxtaposition of scientific visions of the future with the social and

¹⁸ ‘Climate: Emissions turn up the heat’, Paul Brown, 05.12.95.

¹⁹ ‘Climate: Emissions...’

²⁰ ‘Climate: A race...’

political practices that are to blame is conducive to self-reflection and re-examination of governmental action.

3.4. 1997: The Kyoto Protocol

The Third Conference of the Parties to the UNFCCC was held in Kyoto, Japan, in 1-10 December 1997. The Protocol agreed there mandated legally binding targets for reduction of greenhouse gases for the first time. This was a contentious goal, both prior to the summit and after it. How did newspapers reconstruct the scientific knowledge upon which Kyoto was founded?

The *Independent* continued to alert the public to the risks associated with the climate change ‘supertanker’²¹ whose ‘irresistible force’ had been ‘heading for collision with two twin, immovable objects – ordinary, everyday politics and economics’²². Large-scale flooding and mass starvation were to be expected²³, as well as a tragic fate for low-lying islands²⁴. Choosing to blow up the imagery of those doomed paradises for a British audience is equivalent to stimulating global responsibility and building guilt.

William Hartston, a new contributor to the *Independent* and free-lance science writer, wrote a series of articles where he attempted to denounce unknowns and contradictions, cast doubts on scientific arguments and disqualify forecasts of negative impacts. The headlines were: ‘Current ideas in climate research’, 19.11.97; ‘Taking a cool look at the threat of global warming’, 28.11.97; ‘Warming or cooling?’, 01.12.12; ‘The politics of climate’, 04.12.97; ‘Weather: The very model of a global argument’, 09.12.97; ‘Predictions of doom and disaster’, 17.12.97. By building a dismissive reading of climate change claims, Hartston sustained a field of inaction. Implicit in his discursive recreations of the problem is a legitimization of the practices that (others claim) originate it. The regular space awarded to Hartston in the *Independent* is strong evidence of an ideological division in this

²¹ ‘Trying to slow the global warming supertanker’, Nicholas Schoon, 24.11.97.

²² Ibidem.

²³ ‘The heat is on, in the world’s warmest year’, Nicholas Schoon and Colin Brown, 28.11.97.

²⁴ ‘Paradise islands: will the world act to save them?’, Nicholas Schoon, 24.11.97, title appeared on page 1; ‘A wet, warm, unhappy Christmas: This year’s El Niño is the worst ever’, Richard Lloyd Parry, *Independent on Sunday* 07.12.97.

newspaper. The economically liberal ideology that was found in the first years may have persisted along with social responsibility in this paper.

Although the *Times* was not so keen on contesting scientific claims on climate change in 1997²⁵, an article in the *Sunday Times* headlined ‘Calm down, it isn’t the end of the world’ (30.11.97) pursued the sustained ridicule of environmentalism that we found in earlier periods. NGOs and most scientists (including those of the IPCC) were presented as ‘visionary hobbits’ who saw in global warming the doom of our age and ‘avoid[ed] economic “progress” like the plague’. The *Times* opposed ‘sense vs con-sense, rationality vs doggerel, moderates with both feet planted firmly on the earth against those with their heads in the clouds.’

By 1997, predictions of the specific impacts of climate change appeared contradictory at times. While the typical forecast pointed to an increase in average temperatures in the UK, the possibility of a considerable cooling due to a potential transformation in the Gulf stream related to melting in the Arctic was also raised. In ‘Damming major rivers is pulling the Gulf Stream nearer’²⁶, Robin Mckie noted that contradictions in predictions were such that ‘we could swelter or freeze, or possibly bake in a desert or see our land washed away’. So what should we make of it?

[Such] a startlingly varied range of forecasts ... does not make warnings about global warming false or hollow. It merely underlines the harsh fact that our planet is entering an epoch of meteorological uncertainty.

Paradox can be an argument for speeding action or for halting it. Despite irony and some cynicism in articles like ‘Record global temperatures bring scientists cold comfort’, ‘Summer in SpitsBritain’ (both by Tim Radford, 28.11.97) and ‘Meltdown. How global

²⁵ Still, there is an attempt to devaluate the human role in the greenhouse effect: ‘Yellowstone gases ‘worse than ten power stations’’, Tunku Varadarajan, 27.12.97.

²⁶ *Guardian*, 30.11.97.

warming could make Britain much colder' (unattributed, 28.11.97), the *Guardian* certainly does not advocate the latter option.

In 1997, there was an increased tendency to penetrate the backstage of science, to discuss the processes of science-making, their contingencies and limitations, actors' interests and commitments²⁷. In the *Guardian* and *Independent*, this was not a strategy for dismissing scientific claims. Inversely, it was often a form to promote trust in them. There was also a heightened reflexivity – an inclination to discuss the reporter's own values and views as well as the media's role in the social construction of scientific and political claims²⁸. All of this means that there was a certain de-sacralisation of science and scientific institutions in the media (cf. Nelkin, 1987; 1991).

4. Conclusions

Through the examination of news articles on climate change, the paper has illustrated that there is a crucial cross-insemination between the normative and the descriptive, or the axiological and epistemological in the media's discursive reconstruction of science. Various dimensions of science representation have been shown to be interlinked with ideology. Firstly, ideology has implications for the interpretation of '*facts*'. The reliability attributed by the media to scientific 'truth' claims, the preferred definitions of 'facts', and the quantity of media space dedicated to a given scientific claim simultaneously derive from and sustain a certain ideology. Secondly, the recognized *agents* of definition of scientific knowledge vary in function of ideological standings. The selection of 'experts' and 'counter-experts' that are given voice depends on and reproduces certain worldviews. Thirdly, the *goals* associated to knowledge also have an ideological basis. The direct or

²⁷ 'Last night's TV: You don't want to do that', Desmond Christy, *Guardian*, 12.12.97; 'Damming major rivers...'; 'Getting warmer, but still a long way from our goal: The Kyoto climate talks', Nicholas Schoon, *Independent*, 12.12.97.

²⁸ 'Getting warmer...'; 'Last night's TV: You...'; 'Greedy Americans and nice, wet Europeans – the politics of weather', Nicholas Schoon, *Independent*, 29.11.97.

indirect implications for individual or governmental action that are drawn from scientific claims result from views of the status quo and contribute to consolidating or challenging it.

The chronological journey of this paper has evidenced both continuities and transformations in the representation of scientific knowledge on climate change. It has also shown striking differences between newspapers. While the press acted jointly as spokespeople for the science establishment in the first few years examined in this paper and enhanced its social authority and power, a radically different image started to emerge at the end of the 1980s, when climate change was politicised. Scepticism and contestation of mainstream scientific claims appeared in the *Times* and the *Independent*. In contrast with its earlier strategy of certainty-making, the *Times* cast doubts on the greenhouse effect and on human causation of the problem. Discrediting the agents of unwanted knowledge was part of that discursive route. When knowledge claims appeared to constitute a threat to ideological principles and arrangements in the political, social and economic realms, the *Times* did not hesitate to harm the reputation of an institution like the IPCC. In ‘critical discourse moments’ like the release of IPCC reports, the *Times* picked individuals at the margins of respected science and magnified their opinions in order to sustain a certain view of the world and a certain social order.

In contrast, the *Guardian* and most authors in the *Independent* conveyed an image of scientific knowledge that emphasized the risks associated to climate change. Consistently promoting confidence in science, by emphasising consensus and enhancing the reliability of knowledge, the *Guardian* and the *Independent* demanded a stronger political intervention on the problem. By re-configuring the state of scientific knowledge in ways that justify and promote preferred courses of social, economic and political action, newspapers discursively construct fields of action and fields of inaction.

As social studies of science have shown, science is always contextual and contingent. It is bound by political, institutional and personal factors and relies on a set of assumptions that are often questionable (e.g. Latour, 1987; Shackley and Wynne, 1995; Demeritt and Rothman, 1999). Yet, researchers have claimed that the media depict scientific work as an ‘arcane activity outside of, indeed, above the sphere of normal human understanding, and therefore beyond serious criticism’ and scientists as ‘problem solvers, authorities, the

ultimate source of truth' (Nelkin, 1991: xiii). The case reported in this paper challenges these claims. Science was subjected to strong contestation in some media. It was depicted as plural and open-ended. Moreover, the contingent conditions of the production of science were often exposed. That served to construct science as either an authoritative and trustable source of knowledge or as a dismissable endeavour. The key factors to explain these variations in media discourses are ideological.

Modes of interpretation and discursive reconstitution of scientific uncertainty are one of the most telling indicators of ideological standpoints. Research has shown that in Germany the media have mainly conveyed an image of certainty of scientific knowledge on climate change (Weingart et al., 2000) and emphasised uncertainty in the USA (McComas and Shanahan, 1999; Zehr, 2000). In Britain there was a trend from certainty to uncertainty. However, readings of uncertainty varied widely between newspapers. In the *Times*, and at points in the *Independent*, a focus on uncertainty aimed to de-legitimate scientific claims that climate change was taking place, to amplify an image of disagreement in the scientific community, and de-authorize the agents and institutions that call for citizen and political mobilization to address climate change. The illations drawn from uncertainty about the goals to be pursued are equally variable. While some organs discuss the issues involved in scientific uncertainty to reinforce the claim of the need for action, others use the same uncertainty as grounds for inaction on climate change. Like uncertainty, ignorance claims (Stocking and Holstein, 1993) were also appropriated by the media in widely different forms. In conditions of incomplete or uncertain knowledge, the *Guardian* and some authors in the *Independent* strongly promoted the precautionary principle. The *Times* and others in the *Independent* advocated business-as-usual.

Some might be tempted to explain variations in the representation of science as a matter of partisan bias. This study indicates that, although that may be a factor, it is far from unique. In the *Guardian* and the *Independent* scientific reporting may have been a weapon of political attack with regard to Tory governments. Yet, we must note that their emphasis on the risks associated to climate change did not contradict Margaret Thatcher's dramatization of the issue: they wanted the government to go further. Instead, it was the Conservative *Times* that built the scientific grounds against political mobilization.

Forms of filtering and reinterpreting information about climate change are rooted in, and reproduce, profoundly divergent value systems. As also shown by analysis of discourse on the politics of climate change (Carvalho, 2003), an ideological culture of neo-liberal capitalism is hegemonic in the *Times*. The *Times* obviously has a Conservative stance on politics. But this is a shade of Conservatism that is not concerned with the long-term or with risk to the preservation of conditions for future generations. In the centre of the ideological constellation of this newspaper is aversion to political control. Free market, individualism and a Promethean view of man's relations with the environment also feature highly²⁹. Maintaining an image of scientific non-closure helped the *Times* contest (inter)governmental measures to combat greenhouse emissions and legitimate the existing economic and social order.

A social democratic ideology is central in the *Guardian*, with values of equity and solidarity often in evidence. The *Guardian* is also prone to an ethics of the global. By highlighting scientific claims on the risks of climate change to distant physical and human environments, the *Guardian* stimulated a sense of global connectedness and global responsibility. In the *Independent* the dominant culture is close to the *Guardian*'s but the newspaper often leans to the views of the *Times*.

Human agency with regard to nature is viewed very differently across the three newspapers. The *Times* intends to exempt man from interference with nature. Hartston and others in the *Independent* do the same. The *Guardian* and most in the *Independent* view man's exploitation of nature as potentially dangerous. These papers favour a stronger regulation of the market but neither shake the main capitalist structures. Their standings fit into 'shallow ecology'. The issue of intrinsic value of nature is excluded from all the papers and anthropocentrism is hegemonic.

The concept of ideological culture proposed in this paper intends to refer to communities of ideas, values and preferences inside media organizations and in their particular audiences. The term culture points to the socially constructed nature of ideologies. Values and norms are, to some extent, always shared. This does not mean that ideologies are internalised by individuals in a fixed and uniform way. In the term culture

²⁹ See Jameson (1994) on 'market ideology' and the totalising nature of the concept of market.

there is room for some pluralism and diversity, as illustrated by differences between Nick Nuttall and Nigel Hawkes in the *Times*. Values and worldviews seem to matter at the individual level too. They may explain the coherent discursive standpoints of Nicholas Schoon (*Independent*) and Paul Brown (*Guardian*)³⁰, for example. These journalists recurrently presented the current economic and political status quo as a threat for environmental security in the future and promoted its transformation. Contrastingly, contributors such as Wilfred Beckerman (*Independent* and *Times*) and Irwin Stelzer (*Times*) constructed the present system as a good one and attempted to reinforce it.

The concept of ideological culture is not equivalent to the notion of professional culture, which entails ideas about journalistic practice and news values. News values of conflict and controversy, together with the wish for ‘balance’, could partly explain the praise of dissent with regard to climate change. Still, this does not justify the frequency of editorials dismissing scientific claims regarding climate change in the *Times*, for example.

Kellner (1995) argues that we should ‘read media culture politically’, aware that media texts embody certain political and ideological positions and have political effects. In this paper, I propose a politicised reading of *science reports* in the press. As suggested by my title, given that the media read scientific papers politically, so should we read the newspapers.

References

- Allan, S., B. Adam and C. Carter (eds) (2000) *Environmental Risks and the Media*, London and New York: Routledge
- Bell, A. (1994) ‘Media (mis)communication on the science of climate change, *Public Understanding of Science* 3: 259-75
- Beck, U. (1992) *Risk Society: Towards a New Modernity*, London: Sage

³⁰ Paul Brown’s personal views on climate change are available in his book on the subject. There he argues that ‘[p]otentially unpopular political decisions have to be taken to mitigate [the] effects [of climate change]’ (1995: 199)

- Brown, P. (1996) *Global Warming. Can Civilization Survive?*, London: Blandford
- Bucchi, M. (1998) *Science and the Media: Alternative Routes in Scientific Communication*, London: Routledge
- Burgess, J., C. Harrison and P. Maiteny (1991) 'Contested meanings: the consumption of news about nature conservation', *Media, Culture and Society* 13 (4): 499-519
- Carvalho, A. (2002) 'Climate in the News. The British Press and the Discursive Construction of the Greenhouse Effect', PhD thesis, University College London
- Carvalho, A. (2003) 'Representing the politics of the greenhouse effect. Discursive strategies in the British media' (forthcoming)
- Demeritt, D. and D. Rothman (1999) 'Figuring the costs of climate change: an assessment and critique', *Environment and Planning A* 31: 389-408
- Dryzek, J. (1997) *The Politics of the Earth. Environmental Discourses*, Oxford: Oxford University Press
- Eagleton, T. (1991) *Ideology. An Introduction*, London: Verso
- Fairclough, N. (1995) *Media Discourse*, London: Edward Arnold
- Gamson, W. (1999) 'Beyond the science-versus-advocacy distinction', *Contemporary Sociology* 28 (1): 23-6
- Gelbspan, R. (1997) *The Heat is On. The High Stakes Battle over Earth's Threatened Climate*, Reading, MA: Addison-Wesley
- Hajer, M. (1995) *The Politics of Environmental Discourse. Ecological Modernization and the Policy Process*, Oxford: Clarendon Press
- Hall, S., C. Critcher, T. Jefferson, J. Clarke and B. Roberts (1978) *Policing the Crisis: Mugging, the State, and Law and Order*, London: Macmillan
- Hansen, A. (1994) 'Journalistic practices and science reporting in the British press', *Public Understanding of Science* 3: 111-34
- IPCC (Intergovernmental Panel on Climate Change) (1996) *Climate Change 1995. The Science of Climate Change*, Cambridge: Cambridge University Press
- Irwin, A. (1995) *Citizen Science: a Study of People, Expertise and Sustainable development*, London: Routledge

- Jameson, F. (1994) 'Postmodernism and the market', in Zizek, S. (ed.) *Mapping Ideology*, London: Verso, pp. 278-95
- Kellner, D. (1995) *Media Culture. Cultural Studies, Identity and Politics between the Modern and the Postmodern*, London: Routledge
- Kempton, W. (1991) 'Public understanding of global warming', *Society and Natural Resources* 4: 331-45
- Lull, J. (1995) *Media, Communication, Culture. A Global Approach*, Cambridge: Polity
- McComas, K. and J. Shanahan (1999) 'Telling Stories About Global Climate Change. Measuring the Impact of Narratives on Issue Cycles', *Communication Research* 26 (1): 30-57
- Nelkin, D. (1987) *Selling Science. How the Press Covers Science and Technology*, New York: W. H. Freeman
- Nelkin, D. (1991) 'Why is science writing so uncritical of science?', in L. Wilkins and P. Patterson (eds) *Risky Business. Communicating Issues of Science, Risk and Public Policy*, New York: Greenwood Press
- Shackley, S. and B. Wynne (1995) 'Global climate change. The mutual construction of an emergent science-policy domain', *Science and Public Policy* 22: 218-30
- Schwarz, M. and M. Thompson (1990) *Divided we Stand*, Hemel Hempstead: Harvester Wheatsheaf
- Seliger, M. (1977) *The Marxist Conception of Ideology. A Critical Essay*, Cambridge: Cambridge University Press
- Sparks, C. (1987) 'The readership of the British quality press', *Media, Culture and Society* 9: 427-55
- Stocking, S. and L. Holstein (1993) 'Constructing and reconstructing scientific ignorance. Ignorance claims in science and journalism', *Knowledge – Creation, Diffusion, Utilization* 15 (2): 186-210
- Trumbo, C. (1996) 'Constructing Climate Change: Claims and Frames in US News Coverage of an Environmental Issue', *Public Understanding of Science* 5: 269-73
- van Dijk, T. (1988) *News as Discourse*, Hillsdale, New Jersey: Laurence Erlbaum
- van Dijk, T. (1991) *Racism and the Press*, London: Routledge

- van Leeuwen, T. and R. Wodak (1999) 'Legitimizing immigration control: a discourse-historical analysis', *Discourse Studies* 1 (1): 83-118
- Weingart, P., A. Engels and P. Pansegrau (2000) 'Risks of communication: discourses on climate change in science, politics, and the mass media', *Public Understanding of Science* 9: 261-83
- Wilson, K. (2000) 'Drought, debate, and uncertainty: measuring reporters' knowledge and ignorance about climate change', *Public Understanding of Science* 9: 1-13
- Wodak, R., R. de Cillia, M. Reisigl and K. Liebhart (eds) (1999) *The Discursive Construction of National Identity*, Edinburgh: Edinburgh University Press
- Zehr, S. (2000) 'Public representations of scientific uncertainty about global climate change', *Public Understanding of Science* 9: 85-103