The Discourse of Climate Change: A Corpus-based Approach

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Abstract

Based on Goffman's definition that frames are general 'schemata of interpretation' that people use to 'locate, perceive, identify, and label', other scholars have used the concept in a more specific way to analyze media coverage. Frames are used in the sense of organizing devices that allow journalists to select and emphasise topics, to decide 'what matters' (Gitlin 1980). Gamson and Modigliani (1989) consider frames as being embedded within 'media packages' that can be seen as 'giving meaning' to an issue. According to Entman (1993), framing comprises a combination of different activities such as: problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described. Previous research has analysed climate change with the purpose of testing Downs's model of the issue attention cycle (Trumbo 1996), to uncover media biases in the US press (Boykoff and Boykoff 2004), to highlight differences between nations (Brossard et al. 2004; Grundmann 2007) or to analyze cultural reconstructions of scientific knowledge (Carvalho and Burgess 2005). In this paper we shall present data from a corpus linguistics-based approach. We will be drawing on results of a pilot study conducted in Spring 2008 based on the Nexis news media archive. Based on comparative data from the US, the UK, France and Germany, we aim to show how the climate change issue has been framed differently in these countries and how this framing indicates differences in national climate change policies.

1.   Literature Review[1]

1.1 The Norm of Objectivity in News Reporting

Boykoff and Boykoff (2004) examined the coverage of climate change in the US prestige press (*New York Times, Washington Post, Los Angeles Times,* and *Wall Street Journal)*. One of their main findings was the presence of a specific journalistic norm which they identified to be in operation. This is the norm of balanced reporting which always aims to find and portray two viewpoints to an issue. By following this norm, US journalists gave fringe scientists quite prominent coverage, to the dismay of scientists working in the context of the IPCC. As a result, Boykoff and Boykoff claim, the norm of objectivity has led to an outcome that prevented accurate reporting on this issue. They state that

> In the end, adherence to the norm of balanced reporting leads to informationally biased coverage of global warming. This bias, hidden behind the veil of journalistic balance, creates both discursive and real political space for the US government to shirk responsibility and delay action regarding global warming. (Boykoff and Boykoff 2004: 134)

We will need to examine if this norm can be observed in other countries as well. In order to do so, we conduct a comparative analysis across national borders.

1.2 Comparative Media Analysis

Boykoff and Boykoff (2004:134) rightly outlined a research agenda that informs several studies that have been published since, including our own efforts:

> ... future studies could integrate macro-structural analysis with the micro-process analysis featured here. Furthermore, future work could delineate partial predictive influences on the production of "balanced" coverage, of global warming, or divergence from it, in order to more finely texture explanations of this media coverage. Finally, comparisons between coverage of global warming in the US prestige press and coverage in other countries would be helpful in distilling some of the complex causal features of adherence to this journalistic norm. Taken together, these multi-method approaches would strongly contribute to further understanding of mass media coverage, and public understanding of global warming. (Boykoff and Boykoff 2004: 134)

Grundmann (2007) found that in Germany no norm of 'balanced reporting' could be observed. In an analysis of newspaper coverage over a 20 year period it was evident that German print media gave prominence to the official scientific consensus as expressed through the IPCC. When comparing advocacy scientists (those that advocate urgent action to prevent climate change) to contrarians (who doubt that there is enough evidence to act), there was a clear bias in favour of the advocacy scientists.

Similar observations have been made about the UK. In fact, Boykoff in a further study, going beyond the older data set and comparing US with UK media coverage, found that

> The results from this analysis reveal a dramatic increase in the quantity of newspaper coverage of anthropogenic climate change in both the UK and the US over the study period, but also an evolutionary shift in US newspaper coverage in 2005 from explicitly 'balanced' accounts to reporting that more closely reflected the scientific consensus on attribution for climate change. (Boykoff 2007: 6)

He discusses various reasons for the shift in US reporting which we will not address within the scope of this article. His conclusion is that the norm of balanced reporting is no longer the dominant framing device for US journalists when writing for quality print media.

Brossard et al. (2004) have compared differences between reporting in France and the US. Comparing the *New York Times* and *Le Monde* over the 10 year period from 1987 to 1997 they found that Downs' issue attention cycle (Downs

1972; Trumbo 1996) could be found in the US but not in France. This finding is significant in that it casts doubt on one of Downs' central assumptions, i.e. that environmental issues do not lend themselves intrinsically to sustained public attention. Downs wrote that

> The media's sustained focus on the problem soon bores a majority of the public. As soon as the media realize their emphasis on this problem is threatening many people and boring even more, they will shift their focus to some "new" problem. This is particularly likely in America because nearly all the media are run for profit, and they make the most money by appealing to the largest possible audiences. (Downs 1974: 42-3).

This highlights the role and potential influence of the journalist who can present a story as interesting and exciting to the audience. There are institutional constraints stemming from the paper's editor which influence the scope of selection and presentation. More importantly perhaps, there are cultural influences. Brossard et al. (2004: 363) point out that French journalists have less autonomy from power elites than in the US. They show greater deference to political leaders and practice a journalism of 'opinion' rather than 'information'. The French press deliberately tries to be less sensational than the US press and has been accused of showing a lack of emotion or attention to human suffering, for example in its coverage of Hiroshima or the first DNA tests in France. US journalists, by contrast, are always in search of an exciting story, are critical of their political elites, and practice 'investigative journalism'.

Brossard et al. claim that social construction of 'exciting news' can be demonstrated. But how exactly this is done differs in the two countries under examination. The US reporting was found to be following a ritual of objectivity, while the French seem to practice a norm of opinion journalism. Fact finding about the science of climate change would thus seem unappealing for a French journalist as this lends itself to a 'journalism of facts'. Brossard et al. hypothesized that the *New York Times* would emphasize the negative consequences of climate change much more, whereas *Le Monde* would not only not do this but would instead focus much more on the political aspects compared to the scientific aspects. They also pointed out that the 'ritual of objectivity' would lead US journalists to seek at least two viewpoints on a story, which in the case of climate change may mean giving equal weight to majority and fringe scientists (or even non scientists).

Like Brossard et al., Grundmann (2007) found that international conferences were a key determinant for media attention. However, other factors played a role, too. One has to be seen in the institutionalization of science reporting through the IPCC, which led to heightened levels of reporting. Whenever an IPCC report is due to be released, there is a flurry of activities associated with it and much speculation about the level of drama and urgency conveyed in it. While this confirms Downs' claim that the issue has to be made sexy in order to command attention, his claim about an attention cycle cannot be confirmed. The amount of reporting seems to reach ever higher levels as years go by.

1.3 The Construction of Meaning

Like many other studies, Carvalho and Burgess (2005: 1467) claim that messages and meaning in newspaper coverage of climate change are socially constructed. By this they mean that

> ...the broadsheet print media are responsive to scientific and social learning, to changing political agendas and contexts, and to the communicative strategies of agencies such as IPCC, as long as those responses complement, or can be made to complement, each newspaper's editorial position.

The authors sampled articles from *The Guardian* (and the Sunday broadsheet *The Observer*), *The Independent* (including *The Independent on Sunday*), and *The Times* (including the *Sunday Times*) over a 20 year period. The authors wanted to find out if the claims and views of different social actors have been reconstructed differently in different newspapers. In other words, the question is how media texts relate to the wider sociopolitical context in which they are produced and consumed.

One might think that the authority of the IPCC, and the fact that we are dealing with scientific issues, would pretty much dictate what journalists can do in terms of 'spinning' a story. However, there is considerable variance between such alleged 'facts' and their presentation to a mass audience. As Carvalho and Burgess (2005: 1467) observe:

> Values and ideological cultures are key to explain variations in the media's reinterpretations of scientific knowledge on climate change, which in turn may either sustain or annihilate the space for particular options for policy making and individual action. While some media may legitimate and consolidate particular policies, others have had a crucial role in drawing attention and building concern for climate change, as well as in contesting political choices and showing that there are alternative courses of action.

This can be illustrated with the reporting of the *Guardian* and the *Independent* on the one hand and the *Times* on the other. Both reported on the release of the Second Assessment Report of the IPCC in 1995:

> While *The Guardian* and *The Independent* amplified the risks and mobilized public concern about climate change, *The Times* attempted to discredit the IPCC. ... *The Guardian*, and to a lesser degree *The Independent*, attempted to keep climate change risk on the public agenda. *The Times* sought to persuade its readers that climate change did not pose any significant risk to society. (Carvalho and Burgess 2005: 1464)

The authors conclude that

> coverage of climate change has been strongly linked to the political agenda on this issue, and particularly to public pronouncements and discursive strategies of prime ministers and other top governmental figures. Furthermore, as noted above, our analysis indicates that the media build particular images of scientific knowledge and uncertainty on climate change, and emphasize or de-emphasize forecasts of impacts, in order to sustain their political preferences regarding the regulatory role of the state, individual freedom, and the general economic and

social status quo. Dangerous climate change is thus both politically defined and ideologically constrained. (Carvalho and Burgess 2005: 1467)

All of these studies have advanced our knowledge about media reporting on climate change in important ways. However, they have been selective in that they sampled only quality print media (an exception is Boykoff 2007), and they were limited in time and scope. We propose to widen the analysis through a novel approach. Using the full text Nexis database, we aim at combining quantitative and qualitative dimensions of analysis. We have started on this work using corpus-based analysis. Our focus is on media frames and discursive structures that we reconstructed inductively. We try to show changes over time, and across national audiences, between 1980 and 2007. In our pilot study, we sampled the US, the UK, Germany, and France. We aim to include other countries at a later stage.

2. *Corpus Methodology*

We followed standard corpus analysis procedures for our pilot project. First of all, we downloaded full text articles from Nexis and stored them in separate folders according to country. We analysed the raw data set according to the number of articles found for each search term for each country. We also calculated the proportion of articles related to climate change as a fraction of the total number of newspapers to see the relative importance of the issue in different national media landscapes. We looked at the distribution of articles over time to see how the issue grew in importance. Using WordSmith Tools, a widely used corpus analysis programme, we then created word frequency lists and collocation lists (collocation is a linguistic phenomenon, indicative of the phraseological tendencies of all languages, whereby the choice of one word tends to favour the co-selection of other words, its collocates, within close proximity in a text). The latter are especially useful to indicate the discourse contexts (and often semantic fields and meanings) in which a word is used. Finally, we selected some instances from concordances to show *verbatim* examples of usage.

Our analysis proceeded by language, by country, and by search term. The search terms used in this pilot study were the most frequent terms identified by previous research such as Boykoff (2007); Brossard et al. (2004); Carvalho and Burgess (2005); Grundmann (2007). In addition, as native-speakers of German and English respectively, the authors initially used their intuition to think of additional search terms; colleagues were also consulted for additional suggestions. These were then used for searching internet engines, and their selection appeared later to be justified by their broadly similar occurrence rates within the Nexis data. In Table 1 we show the Google results for those terms (as of February 19th 2008). The specifics of Google reveal the anomaly that results for 'any language' are lower than for 'German pages only', whereas the English results are the other way around – apart from 'greenhouse effect'. However, the fact remains that the search terms selected are far more frequent than any other similar terms that we or our colleagues could think of. The only exception is Klimaschutz, which was frequent in the downloaded Nexis data, see below.

Table 1: English and German search terms and their frequencies on Google

SEARCH TERM	Google hits: "any language"	Google hits: "German pages only"	NEXIS - GERMAN	
			No of articles	No of words
Klimawandel	2,250,000	2,640,000	41,938	19,894,553
Treibhauseffekt	362,000	441,000	3,495	2,549,506
Klimakatastrophe	274,000	311,000	3,034	2,048,800
globale Erwärmung	44,200	235,000	11,253	5,821,393

	Google hits: "any language"	Google hits: "English pages only"	NEXIS - USA		NEXIS - UK	
			No of articles	No of words	No of articles	No of words
climate change	23,800,000	5,610,000	104,842	82,111,766	88,036	50,729,324
global warming	24,600,000	3,300,000	153,525	129,185,798	68,608	42,967,535
greenhouse effect	1,390,000	1,490,000	12,689	10,468,247	4,851	3,521,171

As we were less confident about French terms, we used a wider range of strategies. We started with a set of search terms used in Brossard et al (2004) and checked their frequencies in Google (see Table 2):

Table 2: French search terms and their frequencies on Google

	Google hits: "any language"	Google hits: "French pages only"	NEXIS - FRENCH	
			No of articles	No of words
changement climatique	742,000	2,530,000	42,285	22,095,905
réchauffement climatique	199,000	1,960,000	17,541	9,734,887
effet de serre	1,560,000	1,910,000	29,691	17,645,318
réchauffement de la planète	856,000	822,000	17,573	14,729,618
réchauffement planétaire	42,000	181,000		
réchauffement du climat	76,700	75,200		
réchauffement global	16,300	61,600		
changement du climat	26,900	25,300		
variation climatique	7,540	7,320		

variation du climat	5,270	4,010
surchauffe planétaire	63	59

We also consulted French colleagues and asked for any comments on this list, other terms we should consider, and other sources we should consult. One suggestion was to consult some dictionaries, so we looked at Oxford-Hachette (1994), Oxford-Hachette Concise (1998) and Collins-Robert (2005) bilingual dictionaries to obtain a reasonable coverage for the past 10 years. The first two gave *réchauffement de l'atmosphère* as an equivalent for 'climate change', but this term was not frequent in Google (20,100 and 19,600 hits respectively). Again, the Google frequencies were roughly matched by the Nexis data. For the purpose of this pilot study, we decided to select the top four French items, as they were substantially more frequent than the others.

So, to sum up, for the US and the UK we used the search terms *climate change*, *global warming*, and *greenhouse effect*. For Germany we used the terms *Klimawandel*, *globale Erwärmung*, *Treibhauseffekt* and *Klimakatastrophe*. And for France we used the terms *changement climatique*, *effet de serre*, *réchauffement de la planète* and *réchauffement climatique*.

3. Results

As Figure 1 shows, in all four countries we see a continuous rise in levels of reporting on climate change. Indeed, there is an exponential rise after 2005. 2007, the latest year in our sample, is the year with the highest levels of reporting ever observed.

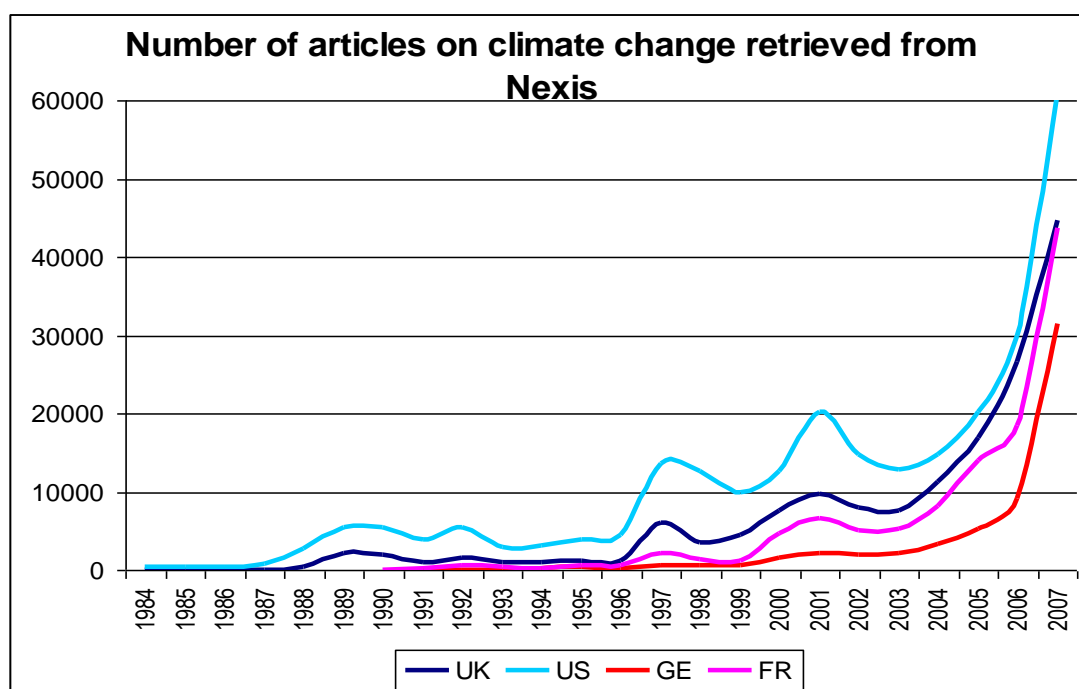**Figure 1:** Number of articles on climate change retrieved from Nexis.

Table 3: Percentage growth in published articles on climate change compared to previous year

	UK	US	GE	FR	Avg
2004	51	15	54	60	45
2005	49	36	61	71	54
2006	57	48	76	31	53
2007	68	103	243	138	138
Avg	56	51	109	75	73

As Table 3 shows, there was an annual increase of 73% on average from 2004-2007 in all four countries. However, the UK (56%) and US (51%) are below the average while Germany and France are above the average (109% and 75%). France's average has been brought down by a 'dip' in 2006 ('only' 31% growth) which remains unexplained at this stage.

In Germany more than 50% of all articles on climate change in the Nexis archive were published during 2007, nearly 40% in France, nearly 30% in the UK and nearly 25% in the US (see Figure 2). This sharp increase in attention can be attributed to various factors which have reinforced each other, such as the Group of Eight (G8) Summit in Gleneagles, Scotland in July 2005, the release of Al Gore's film *An Inconvenient Truth* in November 2006, the publication of the UK 'Stern Review' on the Economics of Climate Change at the end of October 2006, and the Twelfth Conference of the Parties to the United Nations Framework Convention on Climate Change (COP12) in Nairobi that began approximately a week later (Boykoff 2007). In February 2007 the Fourth Assessment report of the IPCC was published, and in October 2007 the award of the Nobel Peace Prize to Al Gore and the IPCC was announced.
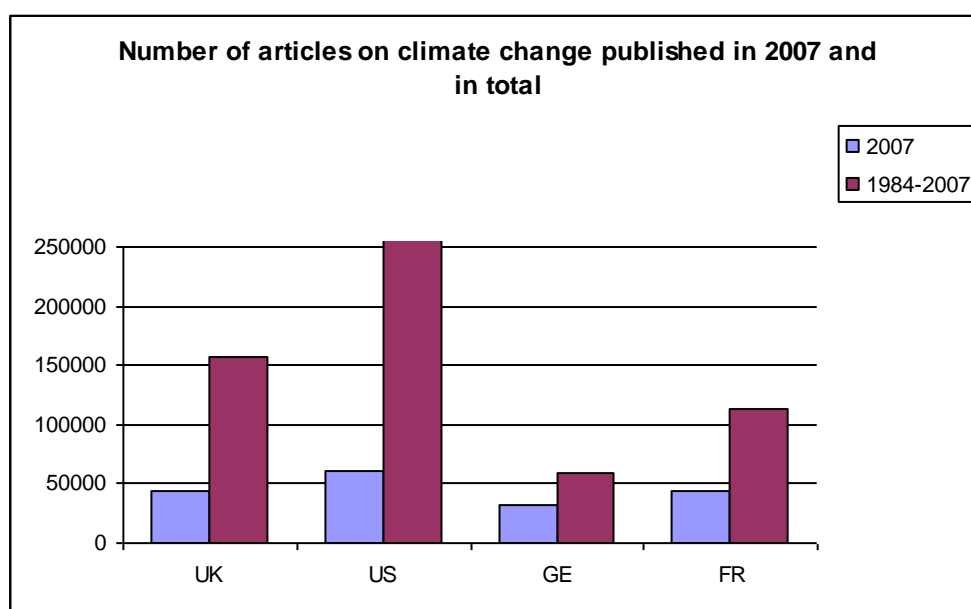
Figure 2: Number of articles on climate change published in 2007 and in total

Table 4: Raw data: news articles on climate change downloaded from Nexis: 1980-2007

Country	No of words	No of articles	No of publications	No of newspapers
US	221,765,811	271,056	1560	326
UK	97,218,030	161,495	663	253
FR	64,205,728	107,090	183	48
GE	30,314,252	59,720	166	21

A first quantitative analysis shows the distribution across countries and news sources (Table 4). The US dominates with more than 270,000 articles, followed by the UK, France and Germany. However, these raw figures are deceptive and do not indicate the relative importance across these four countries. We excluded the first five years as there was only very low level coverage, limited to the US media. We then calculated the numbers of words and articles per source and see a very different picture. The relative importance of the topic has been far higher in the two major continental European countries as opposed to the Anglo-American world (see Figures 3 and 4 - unfortunately there is no easy way to present this ratio, as the number of media sources varies over the years. Note that German sources usually have lower wordcounts than English and French ones, because the German language favours compounding, so the high German figures are even more significant than they might appear).
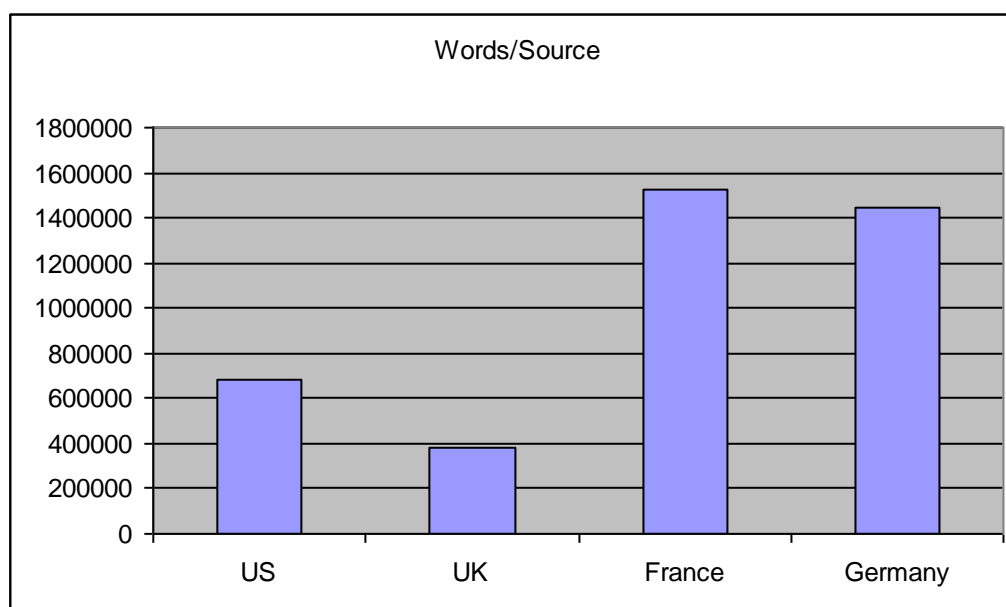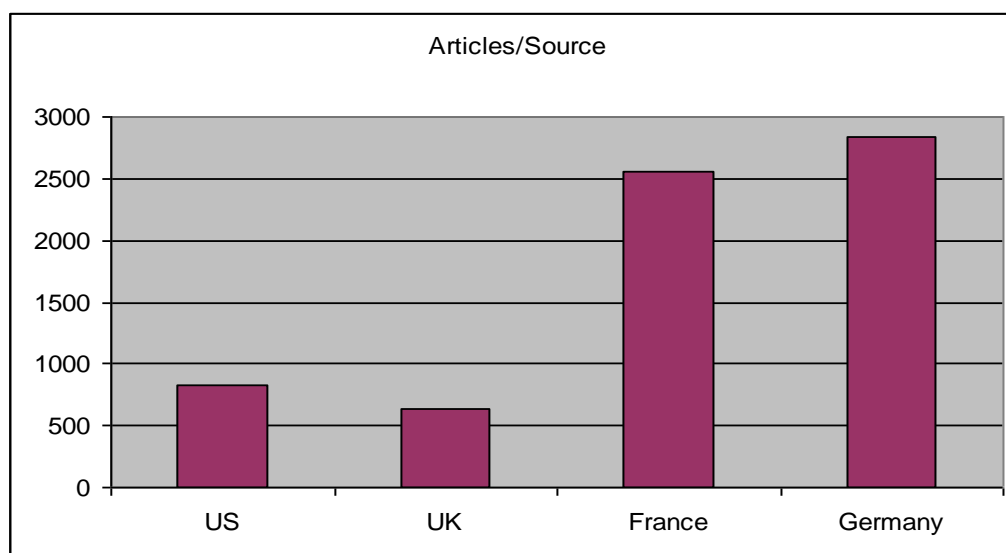
Figure 3: Words per source (1984-2007)

Figure 4: Articles per source (1984-2007)

Articles/Source

There were five times more articles on climate change in French and German sources compared to UK and US sources in the period under examination. Overall, the relative importance of climate change has been far greater in the German and French print media over the past 20 years. It will be interesting to see in more detail how this changed over time—something that awaits further analysis.

Let us now examine the prevalence of specific terms used to describe climate change. We performed a frequency count of the terms *global warming, climate change* and *greenhouse effect* for the US and UK.

Table 5: ENGLISH articles from Nexis UK: 1980-2007

Source	Search term	No of Articles	Wordcounts	Average length (words)
US News (Excluding Newswires)	global warming	153525	129185798	841
US News (Excluding Newswires)	climate change	104842	82111766	783
US News (Excluding Newswires)	greenhouse effect	12689	10468247	824
	SUBTOTALS	271,056	221,765,811	818
UK newspapers	climate change	88036	50729324	576
UK newspapers	global warming	68608	42967535	626
UK newspapers	greenhouse effect	4851	3521171	726
	SUBTOTALS	161,495	97,218,030	602

As Table 5 shows, in the US, the preferred term is *global warming*, closely followed by *climate change*, with *greenhouse effect* being dwarfed by a factor of 10.

In the UK, the preferred term is *climate change*, closely followed by *global warming*, with *greenhouse effect* again being dwarfed by a factor of more than 10.

The analysis for France was done using the search terms changement climatique, effet de serre, réchauffement de la planète, and réchauffement climatique.   For Germany we used Klimawandel, globale Erwärmung, Treibhauseffekt and Klimakatastrophe.

Table 6: FRENCH and GERMAN articles from Nexis : 1980-2007

Source	Search term	No of Articles	Wordcounts	Average length
French Language News	changement climatique	42285	22095905	523
French Language News	effet de serre	29691	17645318	594
French Language News	réchauffement de la planète	17573	14729618	838
French Language News	réchauffement climatique	17541	9734887	555
	SUBTOTALS	107,090	64,205,728	600
German Language News	Klimawandel	41938	19894553	474
German Language News	globale Erwärmung	11253	5821393	517
German Language News	Treibhauseffekt	3495	2549506	729
German Language News	Klimakatastrophe	3034	2048800	675
	SUBTOTALS	59,720	30,314,252	508

In France, the most frequently used term was *changement climatique*, followed by *effet de serre*, while in Germany it was *Klimawandel* followed by *globale Erwärmung* (see Table 6).

The next step in our analysis was the creation of frequency lists of content words in articles retrieved for each search term from sources in each of the four countries in the period under consideration (see Tables 7 and 8). We did this by eliminating grammatical words from the raw word frequency lists. In US and UK sources (see Table 7), the words forming the search terms tend to occur in the first two rows of the tables in most cases.   However, we noted with interest that *energy* is one of the top content words for both US and UK, no matter under which search term we look.

Of the search terms, *greenhouse effect* seems to be more associated with scientific reporting and less with political issues. Words such as *carbon*, *dioxide*, *scientists*, and *warming* dominate. For the two more frequently used terms *global warming* and *climate change,* we see a difference in content word frequency between the US and the UK. While the US sources frequently

use words like *state*, *people*, *president* and *Bush*, apparently seeing the issue largely as one to do with its own polity and country, the UK sources use *global*, *world*, *US* and *UK*, which indicate a greater emphasis on the international dimensions of the problem.

We colour-coded the words in the frequency lists intuitively, using blue for science frames and yellow for political frames. In addition, there were action-related words which we coded in red, and morally charged words which we coded in purple. Note that these correspond roughly to Entman's (1993) definition of framing as comprising: problem definition, causal interpretation, treatment/recommendation and moral evaluation.

We realize that several of these words might belong to more than one frame. For example, some words could belong to a scientific as well as to a political frame, such as *cause*, *planet*, *global*, *Erde*, *planète*, *percent*, *environment*, etc. We have left cells containing such ambivalent words uncoloured. For example, *global* could refer to *global climate change* but also to *global efforts* to halt it. In the first context it would belong to a science frame, in the second to a politics frame. We have thus excluded *global* from the coding scheme.

The words *intergovernmental* and *panel* could be taken at face value and therefore be coded as belonging to a political frame. We are aware that these words in nearly all instances refer to the Intergovernmental Panel on Climate Change (IPCC) which was set up in 1988 by two United Nations organizations, WMO and UNEP (membership in the IPCC is therefore open to members of these two organizations). This body is unique in that it comprises scientists and government representatives. It is a hybrid or 'boundary organization' (Miller 2001). Its task is not to carry out scientific research but to 'assess scientific, technical and socio-economic information relevant to the understanding of human induced climate change, potential impacts of climate change and options for mitigation and adaptation.' (IPCC website). This construction is fairly unique and has led to much confusion about its 'nature'. The IPCC itself claims that it is 'a scientific intergovernmental body' which obscures the fact that the ultimate authority in wording the reports lies with government representatives, not scientists. However, the IPCC is generally seen as the authoritative scientific body that pronounces on climate change. Therefore, we have coded the words *intergovernmental* and *panel* as scientific.

We included some other words that could be considered as ambiguous, such as *world* or *people*, as these are more likely to occur in explicitly political contexts rather than scientific ones. This step in our analysis is, however, of limited importance and merely suggestive of future analytical methodology, which would be based on empirical analysis rather than intuitive assignments.

Where reference is made to actors or to countries, it belongs to a political frame, whilst references to carbon emissions, causes, consequences, effects, etc. belong to a science frame. Several words were not classified (references to time, change, the environment, etc.).

Table 7: Frequency lists of content words in US and UK sources. Note: in lists output by WordSmith Tools, all words are capitalized.

US	UK	US	UK	US	UK
climate change		global warming		greenhouse effect	
CLIMATE	CLIMATE	GLOBAL	GLOBAL	GLOBAL	GREENHOUSE
NEW	CHANGE	WARMING	WARMING	WARMING	EFFECT
WARMING	ENERGY	NEW	NEW	GREENHOUSE	YEARS
ENERGY	NEW	ENERGY	CLIMATE	NEW	ENERGY
CHANGE	PEOPLE	PEOPLE	PEOPLE	YEARS	GLOBAL
YEARS	YEARS	YEARS	YEARS	CARBON	NEW
EMISSIONS	MR	PRESIDENT	CHANGE	EFFECT	CARBON
ENVIRONMENTAL	GLOBAL	STATE	WORLD	CLIMATE	WORLD
STATE	WORLD	BUSH	ENERGY	ENERGY	CLIMATE
PEOPLE	US	CLIMATE	LAST	DIOXIDE	PER
PERCENT	GOVERNMENT	ENVIRONMENTAL	PG	ENVIRONMENTAL	WARMING
STATES	CARBON	TIME	TYPE	SCIENTISTS	PEOPLE
PRESIDENT	PG	WORLD	MR	PERCENT	DIOXIDE
GREENHOUSE	EMISSIONS	PERCENT		WORLD	CHANGE
CARBON	UK	STATES		PEOPLE	US
WORLD	ENVIRONMENT	EMISSIONS		TIME	TIME

Colour coding: yellow= political frame, blue=science frame

We performed the same exercise for France and Germany (see Table 8) and found that the first two rows of the tables were less consistently represented by the words forming the search terms. Instead, we find the words *pays* (FR) and *Prozent* (GE).   And again in contrast to the Anglo-American results, *énergie/Energie* were far less frequent, even less so in the German press than in the French.   Instead, we observe a high importance given to political frames, especially to the country itself (*France, français, Deutschland*), but also to the United States (*États-Unis, USA*).   Again, this could indicate a strong emphasis on the issue of international cooperation. Noteworthy is the strong political framing in Germany, which can be seen by the near absence of scientific frames.   We also discovered that in German sources, the term *Klimaschutz* was used quite frequently, something that had escaped our initial search term selection strategy. We will therefore refine this strategy in future research.

Table 8: Frequency lists of content words, France (FR) and Germany (GE). Search terms for FR: cc = *changement climatique*, es = *effet de serre*, rp = *réchauffement de la planète*, and rc = *réchauffement climatique*. Search terms for GE: kw = *Klimawandel*, ge = *globale Erwärmung*, te = *Treibhauseffekt* and kk = *Klimakatastrophe*.

FR-cc	FR-es	FR-rp	FR-rc	GE-kw	GE-ge	GE-te	GE-kk
PAYS	EFFET	PAYS	CLIMATIQUE	PROZENT	PROZENT	PROZENT	KLIMAKATASTROPHE
FRANÇAIS	GAZ	RÉCHAUFFEMENT	RÉCHAUFFEMENT	KLIMAWANDEL	JAHREN	JAHREN	WELT
EFFET	PAYS	CLIMATIQUE	PAYS	JAHREN	KLIMAWANDEL	TREIBHAUSEFFEKT	JAHREN
FRANCE	SERRE	FRANCE	FRANÇAIS	DEUTSCHLAND	USA	MENSCHEN	PROZENT
GAZ	EMISSIONS	EFFET	FRANCE	USA	WELT	ERDE	DEUTSCHLAND
ENVIRONNEMENT	FRANÇAIS	ÉMISSIONS	EFFET	KLIMASCHUTZ	MENSCHEN	WELT	MENSCHEN
CLIMATIQUE	FRANCE	GAZ	GAZ		ERWÄRMUNG		USA
ÉMISSIONS	ENVIRONNEMENT	SERRE	MONDE		GRAD		
SERRE	ÉNERGIE	ENVIRONNEMENT	ÉMISSIONS		DEUTSCHLAND		
ÉNERGIE	DÉVELOPPEMENT	CLIMAT	ENVIRONNEMENT				
DÉVELOPPEMENT	CLIMATIQUE	MONDE	DEUX				
MONDE	KYOTO	ÉNERGIE	ANS				
DEUX	MONDE	DEUX	SERRE				
KYOTO	DEUX	DÉVELOPPEMENT	DÉVELOPPEMENT				
RÉCHAUFFEMENT	PROTOCOLE	KYOTO	PRESIDENT				
CHANGEMENT	ANS	ANS	CLIMAT				
PRESSE	ETATS-UNIS	PROTOCOLE	ÉNERGIE				
CLIMAT	CLIMAT	ETATS-UNIS	ETATS-UNIS				

Table 9: COLLOCATION lists – ENGLISH: content word collocates (+/-5 words). Colour coding: yellow=politics frame, blue =science frame, purple= action frame

US-cc:	UK-cc:	US-gw:	UK-gw:	US-ge:	UK-ge:
change	change	warming	warming	greenhouse	greenhouse
CHANGE	CHANGE	WARMING	WARMING	GREENHOUSE	GREENHOUSE
CLIMATE	CLIMATE	GLOBAL	GLOBAL	EFFECT	EFFECT
GLOBAL	GLOBAL	CLIMATE	CLIMATE	GASES	GASES
PANEL	TACKLE	SCIENTISTS	EFFECTS	GAS	GAS
INTERGOVERNMENTAL	LEVY	GREENHOUSE	CHANGE	EMISSIONS	EMISSIONS
WARMING	TACKLING	TREATY	CAUSED	WARMING	CARBON
ENERGY	EFFECTS	CAUSE	THREAT	CARBON	GLOBAL
EFFECTS	IMPACT	EMISSIONS	WORLD	GLOBAL	WARMING
RESEARCH	ENERGY	GASES	EMISSIONS	DIOXIDE	DIOXIDE
INTERNATIONAL	ACTION	POLLUTION	TACKLE	REDUCE	ATMOSPHERE
KYOTO	PANEL	EFFECTS	EFFECT	ATMOSPHERE	CAUSED
ENVIRONMENTAL	WORLD	KYOTO	POLLUTION	SCIENTISTS	REDUCE
ISSUE	THREAT	REDUCE	COMBAT	HEAT	RUNAWAY
REPORT	ISSUES	THREAT	CARBON	CAUSED	CLIMATE
NATIONS	MR	CONTRIBUTE	SCIENTISTS	OZONE	CONTRIBUTE
SCIENTISTS	COMBAT	FIGHT	IMPACT	CLIMATE	OZONE
POLICY	INTERGOVERNMENTAL	TREND	GREENHOUSE	PERCENT	CAUSE
ADDRESS	BILL	ENERGY	US	REDUCING	SCIENTISTS
ISSUES	HELP	ISSUE	FIGHT	RAIN	CHANGE
HUMAN	NEED	BUSH	DUE	CONTRIBUTE	CAUSING
CONFERENCE	PEOPLE	REAL	GASES	KNOWN	WORLD

We now take the analysis one step further and look at collocation lists. These are compiled by analyzing the most frequently occurring words in the articles within five words to the left or right of a keyword (in this case *change*, in articles retrieved by the search term *climate change; warming* in articles retrieved by the search term global warming; and *greenhouse* in articles retrieved by the search term *greenhouse effect*).

In Table 9 we have introduced an additional color code for action orientation. Looking at the collocates of *change*, in articles retrieved by the search term *climate change* , we see an interesting difference between the US and UK sources, in that the US shows a prevalence of neutral collocates, relating to science and international politics, such as the *Intergovernmental Panel on Climate Change*, *research*, *scientists*, *Kyoto*, and *conference*. The UK, in contrast, shows an emphasis on action which could be deemed urgent. Frequent collocates include *tackling*, *combat*, *threat* and *levy*, the latter probably referring to the *climate change levy*.   We can confirm such hypotheses easily by using the 'clusters' function in WordSmith Tools, which tells us that *climate change levy* does indeed occur in 4293 out of the total 7771 instances of *levy* in the UK articles retrieved by the search term *climate change*. We can also use the 'concordance' function to inspect instances of any word in all its contexts, for example instances of *levy*, or even more specifically instances of *climate change levy* (only 10 randomly selected examples, in 68-character contexts, are shown here):

    despite generous funding from the climate change levy and the landfi

    e calls to double the rate of the climate change levy. Far more sensi

    uld review the role played by the climate change levy. Longer-term,

    is also worth considering the UK Climate Change Levy. Broadly, by r

    t price and also the value of the Climate Change Levy exemption, ROC

    ng, increasing gas prices and the climate change levy had made it dif

    ort, while £30 million comes from Climate Change Levy Exemption Certi

    d that by 2010 exemption from the Climate Change Levy will be worth u

    n wines, spirits, beers, betting, climate-change levy (what hypocris

    result in lower running costs and climate change levy exemption."

Collocates of *warming* (in articles retrieved by the search term *global warming*) show that the US press uses words such as *threat* too, but the UK press does so far more frequently. Global warming thus seems to involve some connotations that relate much more to political action, something which was very much on the mind of political activists engaged in climate change politics (Pielke 2008: 37-8; see also Whitmarsh 2009).

Table 9 also shows a dominance of political frames revealed by collocates of *change* in articles retrieved by the search term *climate change*, whereas science frames dominate collocates of *warming* in articles retrieved by the search term *global warming* and collocates of *greenhouse* in articles retrieved by the search term *greenhouse effect*. The science frame also dominates the main collocates across the different countries and search terms.

The same applies to the US articles retrieved by the search term *climate change,* where there is a strong science component (*intergovernmental* and *panel* occurring near the top of the collocate list). The UK has action frames nearer the top (*tackle, tackling, levy).*

In the collocate list for *greenhouse* in articles retrieved by the search term *greenhouse effect*, we see a generally very scientific set of words, except for *runaway* in the UK articles. Many of the collocates like *cause, carbon, dioxide, effect, climate* and *ozone* indicate a highly scientific discourse. We can again test this hypothesis by looking at concordances (our highlighting)

Ark said that assuming that greenhouse warming would **cause** the

on the conditions which **cause** the Greenhouse Effect, was told the ele

hing to bear in mind is that the 'greenhouse' gases that **cause** 'the

 reduce the gases which **cause** the greenhouse effect by trapping the e

a **cause** of both acid rain and the greenhouse effect,' she pledged.

The term 'runaway' can belong to a scientific discourse, but indicates the dramatic dimension of future climate change.

postulating a so-called '**runaway** greenhouse effect' as the increase

ible case scenario of the **runaway** greenhouse effect is believed to h

The ultimate example of a **runaway** greenhouse effect is the planet Ven

We now turn the attention to the collocation data from France and Germany (Table 10). Here we note that the action frame is highly evident, maybe even more so than in the UK. In addition, and in contrast to both the US and UK, we see a moral frame that attributes responsibility.

Table 10: COLLOCATION lists – FR / GE content word collocates (+/-5 words). Additional colour coding: red=moral frame

FR	FR	FR	FR	GE	GE	GE	GE
changement	Réchauffement	serre	réchauffement	klimawandel	erwärmung	treibhauseffekt	klima-katastrophe
CHANGEMENT	RÉCHAUFFEMENT	SERRE	RÉCHAUFFEMENT	KAMPF	GLOBALE	MENSCHEN	DROHENDE
CLIMATIQUE	CLIMATIQUE	EFFET	CLIMATIQUE	MENSCHEN	GLOBALEN	KAMPF	DROHENDEN
CONTRE	CONTRE	GAZ	CONTRE	FOLGEN	FOLGEN	KOHLENDIOXID	VERHINDERN
LUTTE	LUTTE	CONTRE	PLANÈTE	GLOBALEN	GRAD	PROZENT	KAMPF
LUTTER	PLANÈTE	LUTTE	LUTTE	GLOBALE	ERDE	ERDE	WORT
CONFÉRENCE	LUTTER	GES	LUTTER	DISKUSSION	KAMPF	VERANTWORTLICH	WELT
EFFETS	CONSEQUENCES	RÉCHAUFFEMENT	PLANÉTAIRE	DEUTSCHLAND	GLOBALER	VERSTÄRKT	JAHRES
ONU	EFFETS	PAYS	CLIMAT	MAßNAHMEN	FOLGE	VERURSACHTEN	ABZUWENDEN
UNIES	EFFET	EFFETS	SERRE	WISSENSCHAFT	AUSWIRKUNGEN	CO2	WELTWEITEN
CONSÉQUENCES	SERRE	RESPONSABLES	EFFET	ANPASSUNG	MENSCHEN	OZONLOCH	ENDE
NATIONS	RESPONSABLES	CLIMATIQUE	CONSÉQUENCES	BEDROHT	ERDATMOSPHÄRE	ATMOSPHÄRE	GORE
FACE	CLIMAT	RAPPORT	GLOBAL		ATMOSPHÄRE	BEITRAG	GLOBALE
CLIMAT	GLOBAL	CO2	EFFETS		VERANTWORTLICH	KLIMAWANDEL	FOLGEN

4. Discussion

4.1 Comparing Findings to the Literature

Coming back to our literature review, several comments are in order. First of all, we could not detect evidence for an issue attention cycle. Instead, we see an overall rise in media attention over the two decades, and a steep rise after 2004, across all the countries in our sample.

Brossard et al (2004) had hypothesized that France would give more political emphasis in their reporting compared to the US. We can confirm this not only for France but also for both the other EU countries in the sample, i.e. Germany and UK.

Boykoff and Boykoff (2004) had found a norm of balanced reporting in the US media which led to the paradox that biased coverage of climate change occurred by following a norm of objectivity. While our data does not allow us to analyze this hypothesis in detail (including their later finding that the US had stopped this practice), it appears from our results that on aggregate no such norm is operating in France, Germany, or the UK.

Previous research carried out by Carvalho and Burgess (2005) and Grundmann (2007) has shown that meaning in climate change discourse is socially constructed. Despite the fact that one authoritative body (the IPCC) performs the assessment of the scientific aspects, and makes policy relevant statements, bordering on political recommendations, different actors interpret these statements in different ways.

4.2 Specific Findings

There is a noticeable divergence in media reporting across the countries examined here. In France and Germany the issue is far more important, compared to the UK and US. This has been demonstrated through the proportion of number of words (and articles) related to the climate change discourse per source. In other words, more articles and more text on climate change appeared in the countries from mainland Europe as compared to the Anglo-American world.

While in all countries there is considerable growth in reporting after 2004, the growth was uneven. There was more growth in France and Germany (compared to the US and UK). From this one can infer that in these countries the relative attention towards the issue of climate change in recent years has increased.

The US discourse is very much dominated by a scientific frame, while the three EU countries are using more political frames, especially France and Germany. The US climate change discourse is largely self-referential, whereas France, Germany and the UK make frequent reference to the US.

We noted significant differences in the frequency of search terms. The US discourse is highly dependent on the specific term used. It makes a big difference whether the term *global warming* or *climate change* is used. *Global warming* is more dramatizing than *climate change,* as it is associated with words such as *threat, reduce,* and *fight*. However, in the UK, words such

as *action*, *threat* and *combat* are associated with *global warming* and *climate change* alike.

In the US, considerable attention has been paid to the perceived value-laden nature of such key terms. Political strategists from various parties and interest groups have pondered the issue. There is an example from a Republican strategist, Mr. Luntz, who urged 'that the term "climate change" be used instead of "global warming", because 'while global warming has catastrophic communications attached to it, climate change sounds a more controllable and less emotional challenge' (*The New York Times*, March 2, 2003). In a survey of UK citizens, Whitmarsh (2009:416) also found that "'global warming' is more often believed believed to have human causes and tends to be associated with ... heat-related impacts, such as temperature increase and melting icebergs and glaciers. The term 'climate change' is more readily associated with natural causes and a range of impacts."

The above quoted *New York Times* article goes on to comment on President Bush's speeches on the environment, and alleges that these 'show that the terms "global warming" and "environmentalist" had largely disappeared by late last summer'. The terms appeared in a number of President Bush's speeches in 2001, but now the White House fairly consistently uses "climate change" and "conservationist". In future analysis, we will examine such claims in a more precise way through the Nexis database, looking at the discursive change over time (especially before/after 2001).

Not only are France and Germany paying more attention to the issue, and using more of a political frame, they are also more dramatizing overall. Words like *lutte*, *combat*, *Kampf*, *verhindern*, *drohend* are very high on our collocation lists, much higher than is the case for the US or UK, where top action-related collocates are *tackle*, *reduce*, and *threat*, with *combat* and *fight* further down the lists (cp. Tables 9 and 10).

Apart from the difference in action frames, France and Germany use a moral frame which attributes responsibility. The US and the UK do not use this frame.

In sum, it appears that the issue is much 'bigger' in France and Germany compared to the US. There is also a heightened sense of urgency and drama and the attribution of responsibility. Expectations are directed towards the US to do something to avert a global crisis or catastrophe. The UK is less of a clear-cut case. It attributes less importance to the issue than France or Germany, and does not use a moral frame. Yet, its use of action frames is more in line with France and Germany than with the US.

5. Conclusion

We have to emphasize that this analysis is based on a pilot project. We had to grapple with specific features of Nexis which make consistent treatment of data difficult. Due to a lack of resources, we could only achieve a limited amount of data cleanup and manipulation.

In our future research we will thus first of all aim to advance our understanding of the Nexis database, which will lead to better cleanup algorithms and thus to more rigorously defined datasets.

We will also analyze more items in greater depth and add search terms revealed by the pilot data: e.g. *Klimaschutz* for the German sources.

The most exciting part of future research will be to identify agency, discourse participants, subtopics, and change over time and across countries. So far we have only attended to traditional 'big political player' nations who have shaped the politics and science of climate change to a large extent. This is in line with previous research. However, we need to know much more about important countries such as Brazil, China, or India. We thus need to widen the countries sampled and expand our database.

Notes

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