Human Development Report **2007/2008**

Fighting climate change:
Human solidarity in a divided world

Human Development Report Office
OCCASIONAL PAPER

Media Coverage of Climate Change: Current Trends, Strengths, Weaknesses

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2007/3

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This background paper provides a comprehensive survey of the role of the media in informing and communicating climate change. This paper looks at how media coverage has shaped discourse and action – in complex, dynamic and non-linear ways – at the interface of climate science and policy. Moreover, this work explores influences of media on practices, politics and public opinion and understanding related to climate change. Research on these interactions are delineated through work that has been undertaken in the United States, Canada, the United Kingdom, France, Germany, Japan, New Zealand, Australia, Honduras, Mozambique, Jamaica, Sri Lanka and Zambia, and explorations of newspaper coverage in forty English-language newspapers in seventeen countries, across five continents. Through these examinations of media coverage of climate change, links are made to related work on public perception and the relationship to international assistance.

Introduction

What role do the media play in influencing personal, national, and international action to address climate change? How much has the media covered climate change, and what is driving changes in that coverage? How do climate change stories come to be reported, and who gets cited as legitimate sources in those stories? What influence do the media play in forming public opinion? Very recent reports have acknowledged the need for foreign aid to help poor nations adapt to climate change: what role is the media playing in mobilizing that aid or making it less likely to materialize?

Through time, mass media coverage has proven to be a key contributor – among a number of factors – that have shaped and affected science and policy discourse as well as public understanding and action. Mass media representational practices have broadly affected translations between science and policy and have shaped perceptions of various issues of environment, technology and risk (Weingart et al. 2000). Within the issue of climate change, two more terms need quick review and clarification: climate change mitigation and adaptation. Mitigation of emissions is the reduction of greenhouse gasses released to the atmosphere. For decades, the only aid to developing countries for climate change was linked to mitigation activities. To illustrate, a recent study found that when consistently categorized, a total of $676 million was given for energy efficiency in developing countries in the 1980s; in comparison, donors gave $4.54 billion for efficiency in the 1990s (Hicks et al. 2007). Renewable energy funding went from $1.6 billion in the 1980s to nearly $3 billion in the 1990s. Total climate change aid of this sort rose from $2.3 billion in the 1980s to $8.4 billion in the 1990s, a 261% increase. Still, this constituted about 1 percent of Official Development Assistance

(ODA). The top donors for this kind of climate change aid in the 19990s was the Asian Development Bank ($2.3billion), the IBRD ($1.4b), the Global Environment Facility ($1.1b), Japan ($1.1 b), the USA ($897m) and Germany ($342m). India and China received $1.6 and $1.4 billion in climate aid in the 1990s.

Adaptation to climate change has been defined by Working Group II of the Intergovernmental Panel on Climate Change as "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial activities" (McCarthy et al. 2001; IPCC WGII 2007). That adjustment can be anticipatory or reactive, planned or grass-roots/spontaneous, public or private. Disaster management can be either based on preparation and prevention or relief, rehabilitation, and reconstruction (recovery) (Muller and Hepburn 2006). There is much debate about what counts as adaptation to climate change, how much funding is needed for poor nations to adapt to climate change, and on how much money is available under the Kyoto protocol and other aid mechanisms (e.g. Muller and Hepburn 2006). However, those seeing an important role for international assistance to poor countries for adapting to the climate change that they did not cause agree that the funding gap is enormous.

Studies have found that the public learns a large amount about science through consuming mass media news (Wilson 1995). In what are conventionally regarded as 'developed nations', many polls have found that television and daily newspapers are the primary sources of information (Project for Excellence in Journalism 2006). For instance, a United States (U.S.) National Science Foundation survey of U.S. residents found that television remains the leading source of news in most households (53%), followed by newspapers (29%) (National Science Foundation 2004). In another U.S. poll that asked 'where did you get your news yesterday', participants most frequently also cited television (57%), followed by newspapers (40%), radio (36%) and internet (23%) (Pew Research Center for People and the Press 2006).[1] In 'developing countries' and more specifically in rural areas, radio has been a principle medium through which climate change news is communicated (Luganda 2005).[2]

Media representations have encompassed a wide range of activities and modes of communication. From performance art, plays, and poetry to news and debate, media portrayals have drawn on narratives, arguments, allusions and reports to communicate various facets of the issue. For instance, Liverman and Sherman examined portrayals of natural hazards in novels and films (Liverman and Sherman 1985). Mass media are generally considered a subset of these broader media practices. Mass media have been defined as the publishers, editors, journalists and others who constitute the communications industry and profession, and who disseminate information, largely through newspapers, magazines, television, radio and the internet. There have been many studies over the last two decades that have examined how mass media have covered a range of environmental issues. For example, Anderson explored interactions between news media and social movements in the issue of nuclear power (Anderson 1997). The intersection of mass media, climate science and policy is a particularly dynamic and high-stakes arena of these communications.

Climate change mitigation and adaptation both require discussion, and for them the issues for media coverage and its impact differ. Mitigation is the reduction of greenhouse gasses released to the atmosphere, and for decades, the only aid to developing countries for climate change was linked to

[1] The numbers add up to more than 100% because people typically access more than one news medium in a given day. Also, trends show that internet use as a source is on the rise.

[2] This is evidenced by initiatives to improve radio communications, such as that of a recent project by the Department for International Development as part of the Millennium Development Goals (Department for International Development (2006). Voices of change: strategic radio support for achieving the Millennium Development Goals. I. a. C. f. Development. London, DFID.).

mitigation activities. To illustrate, our recent study found that when consistently categorized, a total of $676 million was given for energy efficiency in developing countries in the 1980s; in comparison, donors gave $4.54 billion for efficiency in the 1990s (Hicks et al. 2007). Renewable energy funding went from $1.6 billion in the 1980s to nearly $3 billion in the 1990s. Total climate change aid of this sort rose from $2.3 billion in the 1980s to $8.4 billion in the 1990s, a 261% increase. Still, this constituted about 1 percent of Official Development Assistance (ODA). The top donors for this kind of climate change aid in the 19990s was the Asian Development Bank ($2.3billion), the IBRD ($1.4b), the Global Environment Facility ($1.1b), Japan ($1.1 b), the USA ($897m) and Germany ($342m). India and China received $1.6 and $1.4 billion in climate aid in the 1990s.

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The mass media plays a largely unexplored role in the future of climate adaptation aid. We review here previous work that may point the way in assessing the role of media in influencing public opinion on assisting poor nations with adapting to climate change. This background paper surveys how mass media coverage has shaped discourse and action – in complex, dynamic and non-linear ways – at the interface of climate science and policy. Moreover, this work explores influences of media on practices, politics and public opinion and understanding related to climate change. In this production process, the paper touches on political economics of how types of media communications, as well as ownership and structure shape these processes. Moreover, we discuss how cultural differences influence national and regional differences in reporting as well as public and policy consumption of news.

Building upon the framework of Carvalho and Burgess (2005), we call these steps in the media production and consumption process the 'three phases' of news production, public discourse, and media consumption, and personal engagement with climate change. In the first phase, large-scale economic and political factors shape the production of news, as do micro-scale issues like the norms and needs of journalists, editors, and producers. In the second phase, climate news stories compete with other issues for public attention and the budget priorities of public officials. This section reviews the debate about Anthony Downs' influential "Issue Attention Cycle," considers the trajectory of climate news – both mitigation and adaptation – in that framework, and then proposes an alternative model of "Public Arenas" which provides a more accurate lens for understanding trends in reporting and opinion on climate change. The third phase examines how knowledge and engagement by citizens with the issue of climate change. Here we examine the difficult issue of how to report on uncertainty in climate science, and the influential role of climate 'skeptics' in paralyzing action. Even without uncertainty about the human causes of climate change, people are often demobilized by feelings of isolation, hopelessness, powerlessness, and lack of public trust in government to effectively address the issues. These issues carry into the penultimate section of the paper, which examines the history of foreign aid for climate change, and reviews a series of studies on how reporting on disasters drives aid

agency budgeting. The paper concludes with a review and discussion of the three phases in news production, public discourse, and media consumption, and personal engagement with climate change, and the future of funding for adaptation to climate change, in both rich and poor nations.

Media and climate risk: An abridged history

Concurrent with early studies of climate change during the 1700s and early 1800s – modern media had begun early stages of what was to become its rapid development. During that time, media growth faced constraints by a number of competing and contradictory factors, such as strong state-control over the public sphere, legacies of colonialism, low literacy rates and technological capacity challenges (Starr 2004). However, in the mid-1800s, media communications expanded their reach and influence tremendously in North America and Europe. Media took shape primarily as mass-circulation print presses in urban centers, where daily newspaper production quadrupled in 40 years, and circulation grew from 0.34 papers per household in 1870 to 1.21 papers per household in 1910 (Starr 2004). Thus, during this time, mass media outlets formed increasingly significant and powerful social, political, economic and cultural institutions (Starr 2004).

Climate science and mass media first came together in coverage of climate change in the 1930s. In the *New York Times* it was written, "The earth must be inevitably changing its aspect and its climate. How the change is slowly taking place and what the result will be has been considered…" (New York Times 1932, 4). Media coverage of human contributions to climate change appeared more clearly in the 1950s. For instance, the *Saturday Evening Post* published a story by Abarbanel and McClusky, entitled 'Is the World Getting Warmer?', exploring links between atmospheric temperature change and agricultural shifts as well as sea level rise (Abarbanel and McClusky 1950). In 1956, Waldemar Kaempffert wrote for the *New York Times*, "Today more carbon dioxide is being generated by man's technological processes than by volcanoes, geysers and hot springs. Every century man is increasing the carbon dioxide content of the atmosphere by 30 percent – that is, at the rate of 1.1^{o}C in a century. It may be a chance coincidence that the average temperature of the world since 1900 has risen by about this rate. But the possibility that man had a hand in the rise cannot be ignored." (Kaempffert 1956, 191). Then in 1957 – the International Geophysical Year – science reporter Robert C. Cowen wrote an article that appeared in the *Christian Science Monitor* called 'Are Men Changing the Earth's Weather?' The article began:

> Industrial activity is flooding the air with carbon dioxide gas. This gas acts like the glass in a greenhouse. It is changing the earth's heat balance. It could bring anything form an ice age to a tropical epoch….Every time you start a car, light a fire, or turn on a furnace you're joining the greatest weather "experiment" men have ever launched. You are adding your bit to the tons of carbon dioxide sent constantly into the air as coal, oil and wood are burned at unprecedented rates (Cowen 1957).

However, in the subsequent three decades, mass media coverage regarding climate change remained sparse. These pieces regarding human's role in a changing climate served to be a rare instances of media coverage of climate science, as well as clarity regarding anthropogenic climate change. There was scant newspaper, radio and television news coverage on topics such as U.S. National Academy of Sciences reports in the 1960s and 1970s that made repeated reference to emergent climate science, and links to anthropogenic sources.

International and domestic climate policy began to take shape in the mid-1980s, primarily through activities of the International Council of Scientific Unions (ICSU), the United Nations Environment Program (UNEP) and the World Meteorological Organization (WMO). In 1985, the Villach Conference convened in Austria to examine impacts of greenhouse gas emissions on the planet. Meanwhile, modern media communications were taking their present globalized form, marked

prominently by increased corporate concentration, conglomeration and commercialism (McChesney 1999). Media power continued to grow, as did conflicting pressures of corporate control and democratic principles (Graber 2000; Doyle 2002). The three media-science-policy spheres collided in the mid-1980s, when media coverage of climate change science and policy increased dramatically. To illustrate, Figure 1 shows the quantity of 'climate change' or 'global warming' coverage in forty of the most influential English-language world newspapers. These newspapers cover seventeen countries across five continents (Table I, grouped by country of origin). Increases in coverage can be noted in Western Europe and North America during the times of the releases of the Intergovernmental Panel on Climate Change (IPCC) assessment reports in 1990, 1995 and 2001. There are also increases in coverage during the 1992 UN Framework Convention on Climate Change (UN FCCC) and the 1997 Kyoto Protocol. A large increase in coverage was evident in Australia, New Zealand, the Middle East, Asia, Eastern Europe and South Africa during the 1997 Kyoto Protocol. At the meetings in Kyoto, Japan, registrants included 3,500 journalists from over 400 media organizations in 160 countries (Leggett 2001).

Many factors contributed to the initial rise in coverage in 1988. Among them was NASA scientist James Hansen's testimony to the U.S. Congress in the summer of 1988. Hansen testified that he was "99 percent certain" that warmer temperatures were caused by the burning of fossil fuels and not solely a result of natural variation, and that "it is time to stop waffling so much and say that the evidence is pretty strong that the greenhouse effect is here" (Shabecoff 1988, A1). This dramatic statement served to generate substantial media coverage, and became a spectacle that signified solidified scientific concern for anthropogenic climate change. Moreover, the summer in which Hansen's visit to the Senate took place was one marked by extreme drought and high temperatures throughout North America. These concomitant events were thought to sensitize many in the climate science and policy communities, as well as the media and public, to the issue of climate change. Demeritt has asserted, "the 1988 heat wave and drought in North America were arguably as influential in fostering public concern as any of the more formal scientific advice" (Demeritt 2001, 307). Figure 2 takes the example of U.S. newspaper and television coverage of climate change, beginning in 1988.[3] In the science and policy spheres, 1988 was also the year in which UNEP and WMO created the IPCC, and the WMO held a landmark international conference called 'Our Changing Atmosphere' (Gupta 2001).[4] More specifically, Figure 3 tracks newspaper coverage of climate change and adaptation in the forty English-language newspapers from 1988 through 2006. Overall, according to Ungar, "what rendered 1988 so extraordinary was concatenating physical impacts felt by the person in the street" (Ungar 1992, 490). These climate change science and policy events and activities were pivotal in shaping media coverage from 1988 forward, during the time when multi-national media corporations underwent further and significant consolidation, through various mergers and acquisitions (Bagdikian 2004).

[3] Various studies in different countries demonstrate an increase in media coverage beginning in 1988: in the United States (Boykoff and Boykoff 2004), Germany (Weingart et al 2000) and United Kingdom (Carvalho and Burgess 2005).
[4] At this conference in Toronto, 300 scientists and policy-makers representing 46 countries convened, and from this meeting, participants called upon countries to reduce carbon dioxide emissions by 20 percent or more by 2005 (Gupta 2001).

Case Studies: U.S. and UK media coverage of climate change

When the issue of global warming first rose to prominence in U.S. and United Kingdom (UK) media, the focus was on mitigation. This was fuelled by public interest generated by the recent policy action around chlorofluorocarbons (CFCs) and the stratospheric ozone hole, as well as political and electoral conditions in the U.S. context (Ungar 1992). For instance, when campaigning in 1988, presidential candidate George H.W. Bush's rhetoric indicated that global warming was a serious problem. On that campaign trail, Bush vowed the administration would deal with global warming, promising to "fight the greenhouse effect with the White House effect" (Peterson 1989, A1). In the UK context, political issues such as conflict around the coal unions influence actions of political conservatives like Margaret Thatcher to point to the need for mitigation action. For instance, a 1988 *New York Times* article pointed to "mounting evidence that carbon dioxide from the burning of fossil fuels and other industrial gases are accumulating in the atmosphere, where they trap heat from the sun like a greenhouse. Many scientists predict that the greenhouse effect will cause the earth's temperature to rise within a century to levels unreached in human experience" (Shabecoff 1988, A8). Overall, coverage in the late 1980s and beginning of 1990 was also dominated by discussions of nuclear energy as a potential alternative to carbon-based consumption as well as U.S. Senate bills introduced to reduce anthropogenic GHG emissions (Weisskopf 1988). However, during these first three years – 1988-1990 – of a large increase in coverage of climate change, reports on climate change adaptation were minimal. In fact, just less than 1% of newspaper reports on climate change or global warming in major U.S. and UK newspapers covered issues of adaptation. (The U.S. newspapers examined here were the *Los Angeles Times*, the *New York Times*, *U.S.A Today*, *Wall Street Journal* and *Washington Post*. The UK newspapers were the *Guardian* (and Sunday *Observer*), the *Independent* (and *Sunday Independent*), the *Times* (and *Sunday Times*), and the *Financial Times*. Thirty of the 3,293 articles on 'climate change' or 'global warming' during 1988 through 1990 in these newspapers covered 'adaptation' (0.9%)).

The beginning of the decade of the 1990s saw an increasingly complex politicization of the triple-interface of climate science-media-policy (Trumbo 1996; Boykoff and Boykoff 2004). This was attributed in part to the coalescence of a small group of influential spokespeople and scientists emerged in the news to refute scientific findings regarding human contributions to climate change (Gelbspan 1998; Leggett 2001; Schneider 2001). These people have been often called 'climate contrarians' or 'sceptics', and have frequently received funding from carbon-based industry interests. At this time and through the 1990s, government officials, who were often armed with the findings of the global warming sceptics, became the most cited source in prestige-press articles, surpassing scientists, who were the most cited source in 1988 (Wilkins 1993; McCright and Dunlap 2003). This had a demonstrable effect on media reporting (Boykoff and Boykoff 2004; Carvalho 2005). Over time, there has been a steady increase in coverage of climate change in the media. Figure 4 shows this increase in U.S. and UK newspapers from 1988 through 2006. The last four years particularly has been a period of more rapid increases, as demonstrated by Figure 5. In the UK, coverage quadrupled in 'quality' newspapers in 2006 as compared to 2003. In the U.S., it increased approximately two-and-a-half times during the same period. During these years, coverage of climate change adaptation also increased substantially (Figure 3). While more is not necessarily better, tracking quantity of coverage helps to identify key discursive phases in climate science-policy, as captured through media attention.

The two largest increases in coverage in the UK took place during the periods of June-July 2005 and September-November 2006. June-July 2005 was marked by two particularly prominent

phases at the science-policy interface that garnered heavy newspaper coverage: the Group of Eight (G8) Summit in Gleneagles, Scotland, and increased scrutiny over greenhouse gas emissions from air travel. The second increase in coverage – September-November 2006 – can be attributed primarily to four interrelated events.
1) the Al Gore film 'An Inconvenient Truth' was released in September, and it contributed to increased news reporting
2) in October Richard Branson made his much publicized 'donation' of three billion dollars on renewable energy initiatives and biofuel research. This personalized story was widely reported.
3) October 30 was the release of the much anticipated, discussed and criticized 'Stern Review'[5]
4) the Twelfth Conference of Parties (COP12) meeting in Nairobi, Kenya boosted already heavy media coverage and linked to articles on public sentiment regarding climate policy action, such as the November 'Stop Climate Chaos' rally in London's Trafalgar Square

In terms of U.S. coverage, the largest increase coincided with the end of this second period in the U.K – November 2006. This upsurge was associated largely also with attention paid to the Stern Review as well as COP12 in Nairobi. However, these events primed connected media coverage of U.S. federal climate policy through the news hook of the mid-term Congressional elections and prominent State-level climate policy action. The second largest increase in U.S. coverage – May-June 2006 – contributed to climate change as an election issue in November. Chiefly, climate policy rhetoric in the elections was catalyzed by heavy media coverage of the end-of-May-2006 U.S. release of the film 'An Inconvenient Truth'. U.S. newspaper reports on the film release spanned the News, Business, Entertainment and Style sections, thus pushing climate change from an 'environmental issue' to one garnering the attention of a wide range of interests and constituents, thereby permeating many political, economic, social and 'celebrity' issues. In addition, during this time the U.S. Supreme Court agreed to take on the long-awaited case regarding whether the Environmental Protection Agency had the authority to regulate greenhouse gas emissions under the federal Clean Air Act. This case turned on whether carbon dioxide was treated as a 'pollutant', and this question – coupled with increased media attention from Gore's film – generated an upswing in coverage. (On 2 April 2007, the court ruled that CO_2 is a pollutant, and thus the EPA can regulate it).

Case Studies: Media coverage of climate change in Australia, New Zealand, France, Germany

Findings in the analyses of U.S. and UK news coverage of anthropogenic climate change are also congruent with undertakings in other country contexts. Analyses of media coverage of climate change in Australia, New Zealand, France and Germany cohere in that each study examined how media coverage influenced interactions between science, policy and the public. Moreover, these studies lay a foundation for work to be carried out in future studies of media coverage of climate change.

For instance, Hay and Israel examined media portrayals of scientific research in the South Australian context. They examined two local Adelaide newspapers – the *Courier* and the *Advertiser* – and mapped some of the complex processes and competing pressures that shape news production

[5] Among a number of statements and findings, the Stern Review reported, "Adaptation policy is crucial for dealing with the unavoidable impacts of climate change, but it has been under-emphasized in many countries" (Stern, N. H. (2006). "Stern review the economics of climate change.").

(Hay and Israel 2001). Another study took up analyses of Australian media coverage of Kyoto Protocol negotiations in the month of November 1998 during the meeting after Kyoto in Buenos Aires, Argentina (COP4). This study analyzed coverage in *The Australian*, *The Sydney Morning Herald, the Daily Telegraph* (Sydney), *The Age* (Melbourne), and *the Courier-Mail* from Brisbane. Through investigations of headlines, page placement and content during this time, the study found that coverage is marked by significant acceptance of the political and expert voices. The study also found that emergent policy discussions were markedly different from the climate science upon which they were based McManus argued that this coverage serves as a detriment to potential public pressure on Australian policy actors to ratify Kyoto (McManus 2000). A final Australian study explored the external influence of media reports on Tropical Cyclone Justin on public understanding of climate change, by analyzing *The Age* (Melbourne), *The Australian* (National), the *Herald Sun* (Melbourne), the *Border Mail* (Albury/Wodonga), *Ballarat Courier* (Ballarat), the *West Australian* (Perth), *Townsville Bulletin* (Townsville), and the *Northern Territory News* (Darwin). The author traced mis-translations, through complex and dynamic interactions between science and the public, via mass media (Henderson-Sellers 1998).

In New Zealand, analyses of climate change science and policy were undertaken through an exploration of media coverage in the early 1990s. Bell's analyses mapped the contested terrain between media information sources and public understanding (Bell 1994; Bell 1994). Researchers have also explored French media coverage of climate change, and have examined cultural factors that influence news production. The study examined newspaper coverage of global warming from 1987 to 1997, and found that French coverage was focused on international relations, while U.S. coverage had focused on conflict between scientists and politicians (Brossard et al. 2004). This work revealed the importance of varying 'domestic environments'. A final example is that of research on German media coverage, and the relations between risk communication and discourses on climate change in science and policy. This study undertook discourse analyses of media coverage in twenty-three publications from 1975 through 1995, including *Der Spiegel*, *Die Frankfurter Allgemeine Zeitung*, and *Suddeutsche Zeitung*. This work mapped interactions between science, policy and media, and illustrated the dynamic, or 'unstable' and contested discourses unfolding within and between them, thereby influencing public understanding and engagement in climate change action. They concluded, "in the German discourse on climate change, scientists politicized the issue, politicians reduced the scientific complexities and uncertainties to CO_2 emissions targets, and the media ignored the uncertainties and transformed them into a sequence of events leading to catastrophe and requiring immediate action" (Weingart et al. 2000, 280).

Overall, through examinations in various country contexts, these studies have sought to more carefully examine the role of the media in climate change science and policy, through empirical examples of key factors and interactions at this interface. Each study has contributed to mapping the contours of interactions between science, policy and practice, via mass media representations.

Factors that influence discourses on climate via the media

Interactions between climate science, policy, media and the public are complex and dynamic. It is clear that science and policy shape media reporting and public understanding, however, it is also true that journalism and public concern shape ongoing climate science and policy decisions and activities. While journalists have consistently viewed their role as one of information dissemination rather than education, the distinction between these roles becomes blurred in practice. A 'circuits of

communication' model in reference to media and environment issues is one developed by Carvalho and Burgess. It provides a useful way to consider these complex processes of media coverage and science-policy interactions as well as personal understanding of climate change (Figure 6). It is important to point out that this model holds for both mitigation and adaptation aspects of climate change coverage; however, the focus for our purposes here is largely on adaptation. This model illustrates three 'phases' or 'circuits' through which communications pass over time (Carvalho and Burgess 2005). Media communications originate and disseminate into the public sphere before entering the private sphere of individual engagement. While all humans are implicated to varying degrees in contributing to sources of greenhouse gas emissions – through household activities, engagement in industrial activities through consumption, transport – those experiencing concentrated impacts are much fewer. So while responsibility is diffuse, subsets of more vulnerable human groups feel the concentrated costs (Lowi 1972). Thus, the media representations that originate and compete for attention in this public sphere are taken up to varying degrees in our personal lives, and feedback again through ongoing media practices over time. These feedbacks shape news framing in subsequent phases, and inform ongoing climate science, policy and practice interactions over time. Overall, media coverage of climate change – both mitigation and adaptation – takes place in the larger context of regulatory frameworks, political constraints and economic drivers. Cultural as well as regional and national differences too contribute to differences in how these interactions take place. The factors all contribute to the ways in which climate change is communicated via media representations.

THE FIRST PHASE of news production: framing, power and the power of framing

As depicted in Figure 6, the first 'phase' of communication is that of the production of news. Media professionals – such as editors and journalists – produce news within a political, economic, institutional, social and cultural landscape. Moreover, news coverage of climate change – both mitigation and adaptation – is produced through journalistic norms and values. In the production of news, stories are partly generated from asymmetrical power relationships, and partly developed through the history of professionalized journalism (Starr 2004). Socio-political and economic factors have given rise to distinct norms and values (Lee 2006), and these that buttress journalistic practices (Bennett 2002). This mobilization of power is complex, and often subtle as well as contradictory. In fact, discontinuities can arise in media coverage through the very professional journalistic norms and values that have developed to safeguard against potential abuses of asymmetrical power (Boykoff and Boykoff 2004). Thus, media coverage of climate change (adaptation and mitigation) is not a simple collection of news articles and clips produced by journalists and producers; rather, representations signify key frames derived through complex and non-linear relationships between scientists, policy actors and the public, often mediated by news stories.

Framing is a process, and an inherent part of cognition whereby content is constructed – in the form of issues, events and information – to order, organize and regulate everyday life. It can be defined as the ways in which elements of discourse are assembled that then privilege certain interpretations and understandings over others (Goffman 1974). Framing permeates all facets of interactions between science, policy, media and the public. For instance, Roger Pielke Jr. has examined the policy implications of the restricted definition of 'climate change' by the UN Framework Convention on Climate Change (Pielke Jr. 2006). The process of media framing involves an inevitable series of choices to cover certain events within a larger current of dynamic activities. These events are then converted into news stories. In recent years, more researchers from fields of environmental sociology, geography, political science and communications have examined framing of

various scientific issues (Szasz 1995; Jasanoff 2004; Demeritt 2006; Nisbet and Huge 2006). Figure 7 depicts there interactions within journalism.

Entman states that, "framing essentially involves selection and salience. To frame is to select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition…" (Entman 1993, 52). Therefore, the construction of meaning and discourse derive through combined structural and agential components. Asymmetrical influences also feed back into these social relationships and further shape emergent frames of 'news', knowledge and discourse. These processes take place at multiple scales. For instance, individual journalists must contend with time and space pressures when reporting the news. Many are codified and explicit (such as column inches), while others are implicit and shaped by social convention (time-management in covering multiple 'beats' sufficiently). These related decisions are made in the context of larger-scale pressures. While some factors like access through ownership and control are more readily apparent, other influences, such as journalists' training are more concealed. The power dynamics that emerge from these elements then becomes re-embedded in *macro*-relations, such as decision-making in a capitalist political economy, and again *micro*-processes such as everyday journalistic practices. Overall, these norms, values and pressures are interrelated and therefore very difficult to disentangle. Multi-scale pressures can be considered in terms of political, economic, social, cultural, ethical and journalistic elements (providing the context for the 'circuits of communication' model in Figure 6).

The terrain: Macro-scale influences shaping media representations of climate change

At the *macro* political-economic level, in recent years media organizations – dominated by developed-country organizations – have continued to consolidate. Efficiency and profit increasingly influence news production (Bennett 1996), and a number of studies have explored how economic pressures and ownership structures have affected news content (e.g. Herman and Chomsky 1988). McChesney has written, "The core structural factors that influence the nature of media content include the overall pursuit of profit, the size of the firm, the amount of direct and indirect competition facing the firm and the nature of that competition, the degree of horizontal and vertical integration, the influence of advertising, the specific interests of media owners and managers, and, to a lesser extent, media employees. In combination, these factors can go a long way to providing a context (and a trajectory) for understanding the nature of media content…" (1999, 31). This statement holds generally across different country contexts as well as across many environmental issues. However, there has been particularly great reliance on climate change coverage from major media organizations based in developed countries, due to the complex nature of physical, biological and cultural aspects of climate change. In other words, in smaller countries as well as those in the 'Global South' there are difficulties in funding and accessing climate science, as well as having the political leverage to institute cooperative actions to combat it. This has been illustrated in numerous times and cases, such as the unsuccessful plight of the Alliance of Small Island States (AOSIS) to make greater cuts in emissions than ultimately were codified in the Kyoto Protocol (Leggett 2001). Despite, aims for reductions as high as 80%, and personal visits to the U.S. by the president of Tuvalu to discuss the importance of climate change actions – both in mitigation and adaptation – the Kyoto Protocol contained overall cuts of merely 5.2% below 1990 levels for the Phase I group of three dozen countries (Leggett 2001). This case also demonstrates how perceived political economic costs – such as re-structuring of carbon-based economy and society – are resisted. In the case of media coverage overwhelmingly framing these issues as 'global' rather than differentiated 'luxury' versus 'survival' emissions, the media functions as a servant rather than challenge to these interests (Agarwal and Narain 1991). By

'survival' emissions, Agarwal and Narain referred to necessary activities, such as burning wood (generating greenhouse gas emissions) to boil water for safe drinking. By 'luxury' emissions, they referred to activities such as driving an eight mile-per-gallon vehicle to the corner chain store to buy blueberries that have traveled 4,000 miles for purchase (thus 'luxuriously' generating greenhouse gas emissions in transport) (1991).

In other research, Gilens and Hertzman have provided "systematic evidence that financial interests of media owners influence not only newspaper editorials but straight news reporting as well" (Gilens and Hertzman 2000, 383). Additionally, deadlines and space considerations constrain journalists (Schudson 1978). For instance, tight deadlines can lead to stories that rely on just one source for information (Dunwoody 1986) and they can limit the ability of journalists to both comprehend and communicate complex climate science (Weingart et al. 2000). Moreover, editorial preferences and publisher pressures can affect news reporting (Schoenfeld et al. 1979). The amount of exposure and placement (front page or buried deep in the newspaper), as well as the use of headlines and photographs – which are often editorial decisions – can also affect how events and situations are construed by the public.

Economic considerations have led to decreased mass-media budgets for investigative journalism (McChesney 1999). This has had a detrimental effect on training for news professionals in covering news 'beats' (Gans 1979; Bennett 2002). According to research by Dunwoody and Peters, the typical journalist in the U.S. is "even less likely to have majored in science or math than is the average U.S. resident" (Dunwoody and Peters 1992, 208). While this study by Dunwoody and Peters focused on the U.S. context, this finding can be generalized across other countries as well. For instance, Harbison et al found this to be the case in analyses of media coverage in Honduras, Sri Lanka, Zambia and Jamaica (to be discussed further below) (2006). Speaking generally to this issue, University of Arizona climate scientist Malcolm Hughes has commented, "There is a huge gulf in the nature of the questions and concerns that come from journalists working very broadly (as generalists)" (Hughes 2005). This trend has served to affect communications of scientific information when complex scientific material is simplified in media reports (Anderson 1997).

The level of the story: Micro-scale pressures shaping media coverage of climate change

These issues begin to work across scales from macro-level political economic factors to *micro*-level processes such as journalistic norms and values intersect with these elements and shape news content (Jasanoff 1996). These include objectivity, fairness, and accuracy. Much as storylines are fueled within science and policy, the mass media play an important role, particularly as the role of translator. Scientists have a tendency to speak in cautious language when describing their research findings, and have a propensity to discuss implications of their research in terms of probabilities. Sheldon Ungar has asserted, "science is an encoded form of knowledge that requires translation in order to be understood" (Ungar 2000, 308). Moreover, scientists tend to qualify their findings in light of uncertainties that lurk in their research. For journalists and policy actors, these issues of caution, probability and uncertainty are all difficult to translate smoothly into crisp, unequivocal commentary often valued in communications and decision-making. For example, in peer-reviewed scientific journal articles, the professional culture of science trains authors to build the case of the research and then place key findings in the results and discussion sections; in professional media reports, journalistic norms instruct reporters to lead with the most important conclusions and discoveries. Therefore, scientific findings usually require translation into more colloquial terms in order for it to be comprehensible. As Weingart et al put it, "the media…tend to translate hypotheses into certainties" (2000, 274).

News-production conditions in this first 'phase' of the Carvalho and Burgess model interact in important ways with *first-order journalistic norms*: personalization, dramatization, and novelty. Boykoff and Boykoff call them 'first-order' norms, because these factors are significant and baseline influences on both the selection of what is news and the content of news stories (Boykoff and Boykoff 2007). The lens of personalization focuses attention on competition between personalities struggling for power and acting strategically in order to improve their prestige and socio-political leverage. The human-interest story conforms to the idea that news focuses on individuals rather than group dynamics or social processes (Gans 1979). The gaze is on the individual claims-makers who are locked in political battle, and thus structural or institutional analyses are skipped over in favor of stories that cover the trials and tribulations of individuals. As an effect, these stories are seldom linked to deeper social analysis. This connects to dramatization. Hilgartner and Bosk write that, "Drama is the source of energy that gives social problems life and sustains their growth" (Hilgartner and Bosk 1988, 62). Dramatized news tends to downplay more comprehensive analysis of the enduring problems, in favor of covering the movements at the surface of events (Wilkins and Patterson 1987). Aforementioned scientific lexicon does not help the issue conform to this dramatization norm; in fact it makes the 'story' less appealing for journalists (Ungar 2000). Moreover, the journalistic valuation of drama can serve to trivialize news content, as it also can lead to the blocking out of news that does not hold an immediate sense of excitement or controversy. However, this norm does not necessarily lead to reduced coverage. In their report entitled 'Warm Words', Ereaut and Segnit have posited that presenting news in this dramatized form is most common, and 'sensationalized' or 'alarmist' reporting "might even become secretly thrilling – effectively a form of 'climate porn' rather than a constructive message" (Ereaut and Segnit 2006, 14).

An example of a dramatic event that generated tremendous news coverage is Hurricane Katrina. Despite scientific uncertainty that remains regarding links between hurricane intensity and frequency and climate change, this event spurred a 'wave' of coverage. In the U.S., Juliet Eilperin reported in *the Washington Post*, "Katrina's destructiveness has given a sharp new edge to the ongoing debate over whether the United States should do more to curb greenhouse gas emissions linked to global warming" (Eilperin 2005, A16). Considerations of links to implementation of international climate policy in the public domain were fuelled further in this case by comments made by prominent political actors. For instance, Jurgen Trittin – Minister of the Environment in Germany – commented, "The American president has closed his eyes to the economic and human damage that natural catastrophes such as Katrina – in other words, disasters caused by a lack of climate protection measures – can visit on his country" (Bernstein 2005, D5).

Dramatization intersects with the common journalistic attraction to novelty (Gans 1979; Wilkins and Patterson 1987; Wilkins and Patterson 1991). Pointing to the relationship between dramatization and novelty in the mass media, Hilgartner and Bosk assert, "saturation of the public arenas with redundant claims and symbols can dedramatize a problem" (Hilgartner and Bosk 1988, 71). Because of the perceived need for a 'news peg,' certain stories are deemed suitable and others are not (Wilkins 1993). Gans asserts there is a "repetition taboo" whereby journalists reject stories that have already been reported in favor of news that is fresh, original, and new (Gans 1979, 169). Stocking and Leonard comment that this "allows persistent, and growing, environmental problems to slide out of sight if there is nothing 'new' to report" (Stocking and Leonard 1990, 40). In practice, this feeds into a preference for coverage of crises, rather than chronic social problems. Therefore, when it comes to climate-change coverage, Wilson notes, "The underlying causes and long-term consequences are often overlooked in the day-to-day grind to find a new angle by deadline" (Wilson 2000, 207). So a tension

continues between science and mass media: within established storylines of climate change, there is a need for novel ways to portray this story.[6]

In combination, through influences on the selection of news and the content therein, these first-order norms initiate and inform a set of *second-order journalistic norms*: authority-order, and balance (Figure 7). Together, these norms and influences contribute to what becomes news, and media coverage of climate change – both mitigation and adaptation. Previous research has argued that such adherence to these first- and second-order norms to 'episodic framing' of news – rather than 'thematic framing' whereby stories are situated in a larger, thematic context – and this has been shown to lead to shallower understandings of political and social issues (Iyengar 1991; Boykoff and Boykoff 2007). This episodic framing can then skew media coverage that affects public understanding of climate change mitigation and adaptation. Authority-order bias is a second-order journalistic norm where journalists tend to primarily, and sometimes solely, consult authority figures – government officials, business leaders, and others (Bennett 2002, 48-49). This highlights "the desirability of social order" and "the need for national leadership in maintaining that order" (Gans 1979, 52). Research has shown that through media coverage of climate change, there is often significant acceptance of political and expert voices by the public (McManus 2000). Moreover, the complex issue of public trust in authority figures may feed back into and influence climate policy decision-making (Pidgeon and Gregory 2004; Lorenzoni and Pidgeon 2006, see discussion in 'third phase' below). The sometimes explicit but often tacit drive to restore order can then serve to defuse or amplify concern about threatening social issues, even if such effects are not warranted.[7] Since environmental issues (such as climate change mitigation and adaptation) often appear in the news because of a looming or unfolding crisis, this penchant for authoritative – often government – sources is not a trivial matter (Miller and Riechert 2000). However, effects of this journalistic norm become less straightforward when there is overt contestation and 'dueling' authorities clash. This leads both back to first-order norms of personalization and dramatization, and to the final second-order norm of balance. Balance is often seen as an activity that carries out the pursuits of objectivity (Cunningham 2003). With balanced reporting, journalists "present the views of legitimate spokespersons of the conflicting sides in any significant dispute, and provide both sides with roughly equal attention" (Entman 1989, 30). In coverage of climate science, balance can help reporters when they lack the requisite scientific background or knowledge, or are facing formidable time constraints (Dunwoody and Peters 1992). With coverage of climate change, the proclivity to personalize news dovetails in an important way with the notion of balance in that it leads to the scenario of the dueling scientists, who receive 'roughly equal attention'.

Boykoff and Boykoff (2004) quantitatively explored how the balance norm was applied to anthropogenic climate change in U.S. newspaper coverage. This study found that, over a fifteen-year period, a majority (52.7%) of prestige-press articles featured balanced accounts that gave "roughly equal attention" to the views that humans were contributing to global warming and that exclusively natural fluctuations could explain the earth's temperature increase. Coverage was divergent from the scientific consensus on this issue in a statistically significant way from 1990 through 2002. These analyses complement findings from other studies of news production and the issue of climate change. For instance, McComas and Shanahan examined ongoing narratives in reporting in the *New York Times*, and the *Washington Post* from 1980 to 1995. They found the agenda-setting function of mass

[6] These 'new' things are actually 'novel ways' of portraying or depicting already existing things, in the context of ongoing storylines and historicized or pre-existing norms and pressures. Hence, it is the 'perceived need'.

[7] Events and issues are often inherently dominated by authority figures working for order. Thus, the attention here is to examine media representations of those traits, and is not to suggest that the appearance of elite figures on news stories is the sole result of journalist adherence to the 'authority-order' norm.

media as important, as well as the influences from external factors – such as dramatic events – that shape coverage (McComas and Shanahan 1999). In addition, Antilla examined newspaper coverage in 255 different sources from 2003 to 2004. She found that wire services have played a key role in shaping the ways in which climate change science is framed and discussed in reporting (Antilla 2005). In the UK, Burgess put forward key foundational and conceptual work regarding the cultural production and consumption of meaning via the media (Burgess 1990). Anderson examined these cultural practices through an analysis of environmental stories, as well as their relation to public and policy attention (Anderson 1997). Furthermore, in 2005, Carvalho examined social, political and cultural struggles to frame the climate change issue in UK newspapers. This study examined three 'broadsheet' or 'quality' UK national newspapers: *The Guardian*, *The Independent*, and *The Times* (Carvalho and Burgess 2005). The authors undertook critical discourse analysis to examine social, political and cultural struggles to frame the climate change issue, and analyzed these framing practices within the constraints of ideological parameters, maintained and perpetuated within the media sources themselves. Other research by Carvalho finds that through multiple feedback processes of communication of climate change risk via the media over time, prominent political actors successfully frame climate risk for their purposes, and align frames with their interests and perspectives (Carvalho 2005). Similarly, Smith examined UK broadcast news media coverage of climate change risk, and the interactions between climate change science, policy, media and public spheres. Through analyses of seminar discussions from 1997 to 2004 by influential actors – such as *BBC* broadcasters – in these communities, he unpacked and assessed key factors that shape decision-making in the development of news stories (Smith 2005).

Overall, this section has discussed the first 'phase' of news production of climate change – both mitigation and adaptation – stories. It has focused on large-scale economic and political factors shape the production of news, as well as smaller-scale issues such as norms and pressures that journalists, editors, and producers face when assembling such coverage. This leads the discussion into the second 'phase', which deals with the legibility of climate news and subsequent discussions in the public sphere, or 'arena'.

THE SECOND PHASE of news in the public sphere: legibility of climate discourse

Figure 6 shows the movements of 'texts' or 'form' into the second 'circuit' of public dissemination. These encoded messages – television/radio broadcasts, printed newspapers/magazines, and internet communications – comprise communications that then compete in public arenas for attention. This coheres with the 'Public Arenas' model that can be nested in this second 'phase' of communication (Hilgartner and Bosk 1988) in considerations of the increases and decreases in media attention to climate change mitigation and adaptation. Hilgartner and Bosk's model "stresses the 'arenas' where social problem definitions evolve, examining the effect of those arenas on both the evolution of social problems and the actors who make claims about them" (1988: 55). The focus here is on one such 'arena' – the mass media – and analytical attention is on "the 'principles of selection,' or institutional, political, and cultural factors that influence the probability of survival of competing problem formulations" (1988: 56).

Previous attempts to theorize the rise and fall of media coverage and public concern for ecological issues have relied on Anthony Downs's 'Issue-Attention Cycle'. For instance, in mapping the environmental policy-making process, Roberts relies on this model to "provide an explanation of the waxing and waning of issues within the policy environment" (Roberts 2004, 141). More specific to climate change, Trumbo utilizes the 'Issue-Attention Cycle' to "present a brief history" of climate change coverage in the news and to "serve as a useful tool" for examining how climate is framed in

the media (Trumbo 1996, 274). In terms of 'agenda-setting' of climate change discourse through the media, Newell leans on this model as an "all-embracing explanation for the nature of media coverage of global warming", despite acknowledgement that the model fails to "accurately depict the complexity and challenging nature of the climate change problem" (Newell 2000, 86).

In describing the 'Issue-Attention Cycle' Downs posited that public attention to environmental issues moves through five sequential stages. First is the "pre-problem stage", when an ecological problem – such as anthropogenic climate change risk – exists but has yet to capture public attention. Downs posits that expert communities are aware of the risks, but this has not yet been disseminated more widely. In the case of media attention of climate change mitigation and adaptation, this might be considered the conditions before 1988, where there were just four stories across forty newspapers in the decade before. The second phase is that of "alarmed discovery and euphoric enthusiasm,", where dramatic events make the public both aware of the problem and alarmed about it. The aforementioned events of the late 1980s can help explain how there were increased 'hooks' for climate change stories. Third, is the "gradual-realization-of-the-cost stage" where key actors acknowledge sacrifices and costs that will be incurred in dealing with the problem. One could argue that this characterization might coincide with the emergence of a cohesive group – since called 'climate contrarians' – that began to challenge scientific findings regarding the presence of an anthropogenic climate change signal. Fourth, is the "gradual-decline-of-intense-public-interest stage" where, according to Downs, actors become discouraged at the prospect of appropriately dealing with the issue, and crises are normalized through suppression and in some cases boredom. It could be argued that this might coincide with the slight decrease in coverage of climate change adaptation in the mid-1990s (Figure 3) and climate change more generally (Figure 1). Finally, fifth is the catchall "post-problem stage", where the formerly 'hot' issue "moves into a prolonged limbo – a twilight realm of lesser attention or spasmodic reoccurrences of interest". In this stage, Downs covers all possibilities when he states that the issue "once elevated to national prominence may sporadically recapture public interest" (1972, 39-41). Scholars have analyzed media coverage of climate change through this model, periodizing media coverage of global warming into distinct phases (e.g. Trumbo 1996; McComas and Shanahan 1999). This cycle is argued to be "rooted both in the nature" of the problem and in the "way major communication media interact with the public" (Downs 1972, 42).

This 'natural history' framework is useful perhaps in considering the intrinsic qualities of the issues themselves that influencing these ebbs and flows of coverage. Yet, the Downs model does not capture the contested terrain upon which 'alarm' and 'costs' are determined and contested, nor does it account for the non-linear factors that shape dynamic interactions between climate science, policy and the public via the mass media (Williams 2000). Logan and Molotch (1987), describe the "easy news" and the "hard news" to report upon ("if it bleeds, it leads"), and the difficulty reporters face when raising issues which might threaten their advertisers or owners' news. Dunlap argues that environmental issues have not conformed to Downs' Issue-Attention Cycle, since the problems have worsened, new problems have arisen, and most importantly, professionalized social movement organizations have been built to keep them alive (1992). Critics have also made the point that cycles may have both sped up in recent years, as well as become less apparent (Jordan and O'Riordan 2000). Moreover, cross-cultural research has found evidence that while the Downs model appears to hold in some contexts, it does not hold in others (Brossard et al. 2004). In sum, this model is left wanting in that it is too partial an explanation, as well as too linear and rigid an interpretation, of the messiness multiple internal as well as external factors shaping climate science-policy/practice interactions. In terms of media coverage influencing public attention, understanding and engagement, it does not account for how the aforementioned journalistic norms such as personalization, dramatization and

balance could under gird what becomes news, rather than just the issue itself. Therefore, the entrenched use of this Downs model has been detrimental in considerations of *how* these media representations are constructed, thus contributing to possible impediments to greater climate change mitigation and adaptation in the public purview.

Considering the 'Circuits of Communication' and 'Public Arenas' models together enables examinations of both intrinsic and extrinsic factors – as well as dynamic and non-linear influences – that shape media coverage of both mitigation and adaptation. This helps move analyses beyond static representations to more accurate analytical lenses for understanding current trends, strengths and weaknesses in media coverage of climate change – both mitigation and adaptation. In this 'Public Arenas' model, there is accounting for dynamic and competitive processes to define and frame the 'problem', and understanding of the institutional arenas that serve as "environments" where social problems compete for attention/grow (like the contexts described in the 'Circuits of Communication' model). Furthermore, there is acknowledgement of the 'attention economy' (Ungar 1992) that brackets the quantity and quality of all aspects of climate change coverage at a given time. There is also consideration of how various political, institutional and cultural factors – as well as actor networks, or 'claims-makers' – compete for the framing and selection (as well as de-selection) of mitigation and adaptation considerations. Media studies researchers have asserted that, "Journalists are less adept at reporting complex phenomena… (and) have difficulty reporting stories that never culminate in obvious events" (Fedler et al. 1997, 94). Moreover, journalists often focus reporting on events, which thus underemphasize these 'creeping' stories as well as the contexts within which they take place (Dunwoody and Griffin 1993). While scientific insights regarding complex issues such as anthropogenic climate change and adaptation evolve over years and decades, through journalistic norms and pressures, media take 'snapshot' selections from this steady stream of enhanced understanding, thus providing truncated interpretations. This feeds back into the production 'phase' of the 'circuits' model, where challenges such as time-scale are not compatible with news conventions (Carvalho and Burgess 2005). Above all, thinking through how these models account for these processes should be useful in considerations of increased media coverage of climate change coverage (including adaptation) in the last two years, as well as the crucial role that mass media plays in public understanding and engagement with the climate change issue.

Amid this increase in coverage in the last two decades, it has only been in recent years that media coverage of climate adaptation has increased substantially. Figure 3 shows results from a search using the keywords 'climate change' or 'global warming' and 'adaptation'. This was conducted in forty of the most influential English-language world newspapers (congruent with Figure 1) (see Table I). There were increases evident during the times of the IPCC assessment reports in 1990, 1995 and 2001, as well as during the times of the UN FCCC in 1992 and the Kyoto Protocol in 1997. Outside of Europe and North America, coverage of climate change or global warming and adaptation is considerably lower. Moreover, coverage that does appear in many of the newspaper outlets are often reproduced news stories from Europe and North American sources. For instance, most coverage that appeared in the *Yomiuri Shimbun* was repurposed material from the *Washington Post*, and the *Los Angeles Times* in the US, as well as the *Independent* from the UK. Further distinguishing between what are conventionally considered 'developing' countries, from this initial sampling of forty newspapers, there is scant coverage of climate change/global warming and adaptation over the last two decades.[8]

[8] The 'East Asian tigers' China/Hong Kong and Korea have been considered 'developed' countries by the World Bank and International Monetary Fund, while South Africa, Malaysia and Thailand have been considered 'emerging economies' Thus, this grouping may not be representative of 'developing countries'. Nonetheless, this demonstrates reduced coverage

In regards to media reporting of climate change adaptation in developing countries, the PANOS Institute has produced an illuminating study (Harbinson et al. 2006). Through surveys of forty-seven print, radio and television journalists from Honduras, Jamaica, Sri Lanka and Zambia, this study found that there has been little interest by editors and journalists to cover adaptation issues related to climate change. Such little coverage, according to those interviewed, included "migration to the cities…using air conditioning…renewable energy projects or recycling schemes…irrigation and seed saving…fuel use change and tree planting projects" (4). Consistently, interviewees cited three main reasons for this across all four countries:

1) low levels of knowledge of the issue: this was linked to a lack of access to "timely, clear and understandable information on climate change" as well as the ways that "scientists, NGOs and institutions us(e) excessive jargon" in communicating the issue (5)
2) insufficient financial resources: this resulted in constraints on first-hand reporting, as well as allocation of time to certain 'green' news beats; for instance, a Honduran reporter commented "I would love to…work only on nature issues…but the press does not give me the opportunity" (9)
3) incongruent habits and priorities: connected to the first two points, this refers to the penchant to cover stories of crime and violence "primarily because these issues 'sell' and so are preferred by editors and advertisers" (5)

Thus, multiple challenges face media reporting on climate, and these pressures can be externally imposed (such as political economic advertising revenue pressures) or internally generated (through the development and application of professional journalistic norms and values). In this public sphere, these challenges are also met with the competitive nature of information dissemination. In other words, there are many issues and problems represented in the public sphere by media coverage, and the issue of climate change is one among many that deserves both attention and action. Overall, in the second phase, we have described how climate news stories – both mitigation and adaptation – compete with other issues for public attention and as well as engagement and action. In working through these complex and dynamic factors, we reviewed two influential organizing models: Downs' 'Issue Attention Cycle', and Hilgartner and Bosk's 'Public Arenas Model'. These models help to make sense of trends in reporting and attention in the public sphere.

Honduras Case Study: The Perfect Storm

As a more specific analysis of one of these countries, we look to media coverage of climate change in Honduras, centered on the 1998 disaster surrounding Hurricane Mitch, which made landfall on the North Coast of the country in October 1998. While scientific research is still debating the extent of connections between hurricane intensity and frequency and climate change, Mitch prompted widespread speculation and discussion in climate policy and public circles. Though it would be impossible to say that global warming *caused* any single hurricane, the increase in air and water temperatures undoubtedly increases the evaporation and energy in the climate system. The devastation from the hurricane event provided a news hook through which many journalists explored the complex nexus of interacting natural forces and potential human influences. Despite scientific caution on the topic, this event sparked many media reports to consider human activities in relation to this event as

in what have not long been considered 'developed countries' and coverage is reported to be further diminished in more representative 'developing' countries.

well as future storm events and climate change adaptation.

The fact that the poorest and most vulnerable countries suffer worst from climate disasters is illustrated dramatically by this case. In this country of 6.3 million people, 53% live in poverty, and 30% in extreme poverty (CEPAL 1999). The story of Hurricane Mitch in Honduras serves as a parable about uneven vulnerability to global climate change, whether present or likely for the future (Cutter 1997; Rodgers 1999; Wisner 2001; Roberts and Parks 2007).

Much like a bomb detonator in an already volatile environment, Hurricane Mitch – a storm that dumped six feet, or one normal year's worth, of rain in two days – arrived in the fall of 1998 in an area of highly explosive social, economic, environmental and institutional conditions. To be fair, the strength of the storm was unprecedented. However, socioeconomic vulnerability, institutional fragility, and poor natural resource management practices seriously magnified the effects of the disaster. Carlos Medina, the former environment minister of Honduras, estimates that deforestation intensified the effects of Hurricane Mitch by at least 30%. Due to extraordinarily high levels of deforestation, when the rains came down, so did the topsoil from the denuded uplands, leading to more than one million landslips and mudslides and monstrous flooding that engulfed entire towns and wiped out much of the region's infrastructure (Comfort et al. 1999; Morris et al. 2002; Lavell 2002). As torrential rains poured down the mountains and hillsides, rivers swelled uncontrollably, in some cases as much as 30 feet higher and 1500 feet wider. The River Choluteca burst its banks near one of the nation's larger cities, "creating . . . an eerie lagoon of untreated sewage and chemical effluents in which corpses flowed by" (Rodgers 1999). With only four helicopters available, the Honduran government faced a country where 60% of the land was engulfed in mud and water. The FAO estimated economic losses in the order of 80% of annual GDP (FAO 1999). The Economist Intelligence Unit (2004) estimates that damages were closer to 95% of Honduras' GDP. Half of the country's agricultural production was destroyed, ninety-four bridges were destroyed, sewage and electricity systems were knocked out, and hospitals, schools, railways, and telecommunication networks were rendered inoperable. As President Carlos Flores Facussé put it, "In 72 hours, we lost what we had built, little by little, in 50 years."

Early estimates indicated that $5 billion would be necessary for reconstruction, which meant that even with millions of aid dollars pouring in, much of the reconstruction burden would have to be borne by local communities (ECLAC 1999; Ranganath 2000; Rodgers 1999). Furthermore, the country's bread-winning economic sector – in terms of foreign exchange – took a heavy hit from the storm and slid into rapid economic decline. In the northern Sula valley, flooding wiped out nearly three-quarters of the banana plantations *and production plummeted to roughly one-fifth of Pre-Mitch levels,* forcing Dole and Chiquita to lay off 25,000 workers (EIU 2004a). Yet what distinguished Hurricane Mitch from other natural disasters were the almost unimaginable human costs: 7,000 deaths, 8,000 "missing," 1.5 million made homeless, and many more left without access to basic public services (CRED-OFDA 2005: EIU 2004a). As time wore on, Mitch also exposed underlying vulnerabilities in the country's "soft" infrastructure. Overcrowded schools functioned as shelters and medical stations, but were unable to stem a massive outbreak of deadly disease. Days after the rains ended, a "silent" disaster of disease quickly consumed the nation. Swollen and surging floodwaters carried excess waste and corpses through the country's water supplies, and cracked sewage pipes and latrines seeped into the floodwaters, creating an ideal breeding ground for epidemics. Diarrhea, a result of dehydration and contaminated water (and the leading cause of death in children worldwide), was commonplace. Leptospirosis, a bacterial infection spread by rodents and exposure to water contaminated with animal urine, also affected large numbers. Mosquitoes began to proliferate in stagnant pools of water, boosting the transmission of vector-borne dengue fever and malaria.

Ultimately, health officials believe 20,000 people contracted cholera, 31,000 became infected with malaria, and diarrhea affected an additional 208,000.

Media coverage of the issue was mainly through on-the-spot television transmissions and radio broadcasts. Foreign correspondents 'flooded' the country, and US reporting on the disaster – in its 'own backyard' – dominated media coverage. One of the authors (Boykoff) was living along the Choluteca River in Southern Honduras, and witnesses firsthand how news pieces were reported mainly through foreign correspondents, where international coverage then effectively mediated local interpretations of local and regional events. Understandably, throughout coverage of the disaster, the focus was on the immediate: again, where the macro- and long-term was foregone in favor of the micro- and short-term crises at hand. Importantly, Boykoff anecdotally found little media discussion of adaptation preceding the storm, thereby contributing to the challenges faced when the storm struck. Overall, the case of Honduras clearly illustrates why poorer nations are at a "structural disadvantage" in preparing for, coping with, and responding to hydro-meteorological disasters. Countries with colonial legacies of extraction are structurally predisposed toward higher levels of social, economic, and institutional vulnerability because they suffer chronically from declining terms of trade, commodity price volatility, and low levels of internal integration, degraded natural environments, weak civil societies, feeble domestic institutions, high domestic inequality, and large informal sectors.

The infrastructure of media sources faces political economic and distribution challenges. Moreover, there has been little coverage of environmental issues such as climate change, particularly in the national newspapers *La Tribuna*, *La Prensa*, *El Heraldo* and *Tiempo*. This is due to aforementioned factors in news production such as insufficient journalist training, and the preference for more concentrated, and dramatic stories on crime/accidents. In the case of media coverage of climate adaptation, scant coverage – attributed in part to journalist training, the nature of the story, different priorities – did not help before, during or after the storm. Rather, it could be argued that this exacerbated detrimental impacts. The additional colonial legacy of weak media institutions feeds into ongoing challenges in media coverage of climate change.

THE THIRD PHASE of personal engagement with climate change via mass media

Figure 6 shows the third 'phase' of communication in the Carvalho and Burgess model, which focuses on the consumption of news media coverage of climate change – both mitigation and adaptation – in the personal sphere. This is a phase where these public discourses permeate and integrate to varying degrees into personal understanding and behavior. William Ruckelshaus – first US Environmental Protection Agency (EPA) administrator – has said, "If the public isn't adequately informed [about climate change], it's difficult for them to make demands on government, even when it's in their own interest" (Ruckelshaus 2004). But *how* this information is interpreted and translated into decisions and potential behavioral change is complex, dynamic and contested.

In theorizing interactions at the science-practice interface, researchers have considered three main 'waves' of engagement (Collins and Evans 2002). The first wave of interactions was that of a 'deficit model' approach to understanding interaction. This perspective posited that poor choices and actions were attributed to 'deficits' of knowledge and information to make the 'correct' choice. The approach was associated with norms and ideals of science as open, universal and objective practices. However, this set of ideal interactions is much more complicated in practice. Since the 1950s, this view has been critiqued (within science studies) for being too simple a characterization of the dynamic interactions between science and policy/practice. However, in the policy and public spheres, there are residual impulses such as the stated reliance on 'sound' science in order to make decisions, as well as the stated pursuits to eliminate uncertainty as a precondition for action. The second wave of

engagement is considered the wave of 'democracy'. Ulrich Beck examined the democratization of the science-practice interface, particularly in his book 'Risk Society' (Beck 1992). There he posited that there are common 'bads' in our risk society as well as common 'goods': techno-economic development itself could actually increase problems in practice rather than solve them. He called for more non-state actor/policy/public engagement and feedback into the processes of science (or 'upstream engagement') in order to more properly account for and deal with the contested spaces of (public and private) engagement with science. The third wave is called the 'normative theory of expertise'. It is similar to the second wave in terms of the democratizing commitments, though it further maps institutional boundaries between formalized science-policy/politics and the lay public. This theoretical move seeks to delineate the variegated roles of generally legitimized and authorized 'experts' vis-à-vis specialist 'experts' in the field in question. In other words, in the case of climate change, this modeling seeks to clarify which groups and institutions may be 'authorized' speakers on climate science, while others are not (Collins and Evans 2002).

Research on public understanding of climate change has burgeoned in recent years. A subset of this work has examined how media representations of climate change influence ongoing science-practice interactions. A salient focus has been on representations of uncertainty. Scientists often have difficulty placing the uncertainty associated with their research into a familiar context, through an appropriate analogy; in other words, "translating error bars into ordinary language" (Pollack 2003, 77). Scientific uncertainty has entered debates regarding action, sometimes serving to inspire inaction (Demeritt 2001); it is an inherent element in all scientific inquiry. A study of US newspaper and magazine coverage from 1986 through 1995 – in *The New York Times*, *The Wall Street Journal*, *The Chicago Tribune*, and *The Los Angeles Times* and unspecified magazines from the popular press – found that uncertainty was consistently prominent theme in reporting. It concludes that uncertainty "was used to help construct an exclusionary boundary between 'the public' and climate change scientists" thereby contributing to deferential citizens and diffused public involvement through acceptance of the need for 'more research' (Zehr 2000, 85). In practice, the mass media have effectively amplified uncertainty through coverage of climate contrarians' counter-claims regarding anthropogenic climate change (Wilkins 1993; Zehr 1999; McCright 2007), without providing context that these claims have been marginalized in the climate science community (Schneider 1993; Dunwoody 1999). Clearly, this can distract from further engagement with climate adaptation issues. Research by Corbett and Durfee (Corbett and Durfee 2004) examined coverage of climate change with a focus on uncertainty. Through an experiment design of three newspaper story treatments – controversy, context and control (neither context nor controversy) – they found that greater contextualization within climate science stories helps to mitigate against controversy stirred up through uncertainty. Thus, reader perceptions were affected by the sometime subtle characteristics (mentioned in the 'first phase' above). In regards to public understanding of climate adaptation, this information on how content impacts reader comprehension is useful.

Connected to content, a number of polls have queried reader comprehension of climate change For instance, Bord, O'Connor and Fisher conducted a survey to investigate links between knowledge of climate change causes and behaviors (2000). Through 1,218 surveys, they found that increased understanding also increases people's stated intentions to do something about it. Providing greater texture to analysis of public perceptions and actions in regards to climate change, a study of beliefs and attitudes about the severity of climate change was undertaken in 1997 and 1998 (Krosnick et al. 2006). Through telephone interviews of 1,413 adults, they found that beliefs were a function of three main factors: possible relevant personal experiences (e.g. exposure to weather disasters), perceived consequences of climate change (e.g. relative vulnerability) and messages from informants (e.g.

scientists via the mass media). Through this empirical research, the authors put forward a mechanism linking knowledge and action: "knowledge may have increased certainty, which in turn increased assessments of national seriousness, which in turn increased policy support…knowledge about an issue *per se* will not necessarily increase support for a relevant policy. It will do so only if existence beliefs, attitudes, and beliefs about human responsibility are in place to permit the necessary reasoning steps to unfold" (Krosnick et al. 2006, 36-37). Among a number of important research projects carried out in this area by Leiserowitz (that I anticipate he will outline in his associated background paper), a 2006 national survey in the US sought to examine climate risk perceptions via affect, imagery and values. Through 673 surveys, he found that respondents perceive climate change as a moderate risk, melting glaciers and polar ice were the most prominent images associated with climate change, and bi-partisan support for GHG reduction policies at the international and national levels (Leiserowitz 2006). However, the study found a disconnect between broad support for policy action and support for policies that could potentially curb individual behaviors related to GHG emissions (such as higher gas prices), and this was influenced most strongly by values (from egalitarian to hierarchical and individual to communal). He concluded that "messages about climate change need to be tailored to the needs and predispositions of particular audiences; in some cases to directly challenge fundamental misconceptions, in others to resonate with strongly held values" (Leiserowitz 2006, 64). This association with values was also a strong feature that influenced views of the 1997 debate on climate mitigation action. Surveys of 1,413 adults found that despite about half of respondents seeing television news coverage of climate change debates on Kyoto action in 1997, few of their opinions on the issue changed (Krosnick et al. 2000). Furthermore, a psychological study of 76 experimental subjects found a preference for mitigation of GHG emissions ("undoing the effects of global warming") over adaptation measures ("providing…economic assistance"). There was also a demonstrated preference for helping people in one's own country before people in other countries (Baron 2006, 146). These studies provide important evidence on the critical need for accurate information and active education of the populace to facilitate climate adaptation, keeping in mind the aforementioned complexities. Furthermore, these studies point out the importance of perspectives and preferences in determining which climate mitigation and adaptation strategies may be more readily accepted, and therefore more successful.

Other studies have investigated the *kinds* of engagement that people have had with climate information. Wilson conducted 649 surveys of university students in 1992 in order to explore this question. Results showed that approximately half of students indicated that media was their primary source of global warming knowledge. Within media, 'national television news' was the most frequent source (Wilson 1995). Another study of 100 university students in 1997, along with a telephone survey of 512 adults was undertaken to explore pathways of understanding climate change causes, consequences and solutions. This study found that newspapers and television were reported to be the most frequent sources of information about global warming and that this was linked to understanding of the connections between fossil fuel use and climate change (Stamm et al. 2000). There have also been many polls asking where people are accessing scientific information within the media. For instance, a 2006 Pew Study found that television is the primary source of information, and the internet is the second most utilized source (Pew Internet and American Life Project 2006). Furthermore, the poll found that 65% of respondents report that they have come across science news when using the internet for other reasons, and just half of those using the internet for science information have gone to a website whose content is devoted to science (Pew Internet and American Life Project 2006). These findings relate to work by Sheldon Ungar (1992, 2000). He asserts that there exists a paradox where increases in specialized knowledge lead to more compartmentalized groups of understanding.

Moreover, he argues that the issue of climate change lacks the day-to-day relevance necessary to motivate people to learn and take action, and that this arena remains a contested space of knowledge, understanding and 'appropriate' action, as efforts to overcome these challenges can be problematic. Ungar concludes, "bridging metaphors can be inappropriate or misapplied, (so) the public could very well be concerned but relatively ill informed about such issues" (Ungar 2000, 309). Therefore, there is a need for *accurate* communications that reach beyond 'conventional' science communications; however, this necessity comes with numerous challenges (outlined above).

Connected to this, a number of polls have also explored public understanding of climate change more generally. For instance, an MIT study found that climate change is poorly understood overall. Through a 17-question internet survey, 1,200 participants responded to questions regarding climate change, and more specifically, mitigation technologies. In ranking 'high-priority' environmental issues for the public, 'global warming' ranked sixth (Herzog et al. 2005). Within this issue, Yale University conducted a poll regarding connections between energy technologies and climate change. Through 1002 interviews, the poll found that while an overwhelming number of respondents (93%) stated that they want government to work on breaking the links between energy use and environmental harm (Yale University School of Forestry and Environmental Studies 2005). In 2007, the Nielson Company conducted a poll of 25,408 internet users across 46 countries, where they asked participants questions that referred to global warming.[9] Three key limitations may have affected and pervaded responses: 1) varying levels of acquiescence, 2) differentiated cultural interpretations of the term 'global warming', and 3) different socio-economic and educational levels of internet users in each country that may deem these response sets unrepresentative of larger public understanding in various countries. Nonetheless, the responses provide insights into public understanding and engagement with climate change, and the scope of the poll is unparalleled. The survey asked 'what is your biggest concern' as well as 'your second biggest concern' in 'the next six months'? It also asked the question 'have you heard or read anything about the issue of global warming?' and, 'from what you have heard or read about global warming, what do you think is causing it?' Overall, Latin Americans and Europeans were found to be the most aware as well as the most concerned about climate change. On the other side, North Americans were reported as the least aware and least concerned (The Nielsen Company 2007).

Table II provides abbreviated results from the surveys with country, age and gender breakdowns. This Table II is constructed to be consistent with the countries explored in Table I and in Figures 1 and 3. Many insights can be drawn from this robust data set. Among them are the following:

- Males report that they have heard or read something about the issue of global warming as much or more than females in 21 of these 24 selected countries (the exceptions are Thailand, India and United Arab Emirates)
- Females express global warming as biggest/second biggest concern as much or more than males 67% of the time (32 of 48 cases)
- Males attribute causes of global warming to 'natural changes' slightly more frequently than females, in these selected countries
- People in their 30s and 40s in these countries were least often the ages groups who considered global warming as biggest/second biggest concern over the next 6 months (evident in 7 of 48 cases, or 15%)

[9] The 46 countries were: Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, China, Czechs Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, India, Indonesia, Ireland, Italy, Japan, Korea, Latvia, Lithuania, Malaysia, Mexico, Netherlands, NZ, Norway, Philippines, Poland, Portugal, Russia, Thailand, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Turkey, UAE, UK, U.S. and Vietnam.

- People in their teens and 20s appeared to be the least informed about the issue of global warming in these selected countries.
- People over the age of 40 most frequently stated 'natural changes' as the cause of global warming in these countries (12.5%; the exceptions were Japan, Korea and Thailand)
- While respondents under 20 in Japan are the group who express most concern over global warming in the next 6 months, they are also the group least informed about it (61% have heard or read about it), or misinformed (see bullet point above). This draws attention to both the apparent opportunity and need to reach younger Japanese with accurate information on climate change.
- The two countries in Phase I of Kyoto Protocol who have not ratified – Australia and US – do not show evidence that their populations are least concerned; Australians actually had the highest percentage of people who expressed global warming as their biggest/second biggest concern

Analyses of other polls have also been undertaken in peer-reviewed literature. In a 2006 article, Lorenzoni and Pidgeon's findings concur with the Nielsen results. Through analyses of fifteen years of climate-change perception polling and research, they found that despite concern for climate change, it is an issue of lesser immediate importance than other daily issues. From this evidence, they state, "a risk communication strategy based on providing scientifically sound information alone…will not be sufficient in itself. Perceptions of climate change are more complex, defined by varied conceptualizations of agency, responsibility and trust. Successful action is only likely to take place if individuals feel they can and should make a difference, and if it is firmly based upon the trust placed in government and institutional capabilities for adequately managing risks and delivering the means to achieve change" (Lorenzoni and Pidgeon 2006, 88). Thus, the issue of public trust in governance emerged as an important feature of climate change action. Moreover, there is an inherent difficulty in dealing with the issue of climate-change adaptation action when the costs are often concentrated and the benefits diffuse, relative to other daily concerns. This is supported by further risk perception research (e.g. Leiserowitz 2005; Lorenzoni et al. 2006) and more recent work on costs and benefits at the University of Purdue Climate Change Research Center (Patchen 2006). These contemporary projects are reminiscent of foundational sociological work across many issues by scholars such as Theodore Lowi (Lowi 1972). This is also mentioned at the beginning of this section.

Within this contested space, it is useful to briefly consider non-state actors, or 'claims-makers' that seek to frame the issue in particular ways. It is worthwhile to seek to understand *how* non-state actors have gained greater discursive traction through the media, and, as a result, have significantly affected public understanding. These actors can range from 'contrarians' to environmentalist NGOs, all seeking to shift discourses on climate change via the mass media in both particular and general ways. An early analysis of claims-makers in the press examined coverage in five U.S. newspapers – the *New York Times*, the *Washington Post*, the *Los Angeles Times*, the *Christian Science Monitor*, and the *Wall Street Journal* – from 1985 through 1995. The study found that over this period, scientists became less dominant sources of information reported in the news (Trumbo 1996). This movement of sourcing from scientists to other actors is consistent with associated studies (e.g. McCright and Dunlap 2003). In the US context, via the aforementioned survey data in 2002 -2003, Leiserowitz found that the interpretive community dubbed 'alarmists' only demonstrated a more prevalent demographic of being 'young'. Meanwhile, those dubbed 'naysayers' – who believed that anthropogenic inputs to global warming are negligible and over-hyped in the media – were found to be largely male, Caucasian, Republican, individualist, hierarchical, and religious . The same pattern has been found in the U.S. for acceptance of risk of all sorts (Kaloff et al. 1993). Of particular interest is that naysayers reported to rely on radio as their main source for news (Leiserowitz 2005). In this work, Leiserowitz also acknowledges that these arenas of claims-making and framing are "an exercise in power…those

with the power to define the terms of the debate strongly determine the outcomes" (Leiserowitz 2005, 1441), and then calls for a more democratized discourse, perhaps akin to the aforementioned interventions of Beck (1992).

Research by McCright and Dunlap has focused on the opposition movement dubbed 'contrarians' or 'sceptics' (McCright and Dunlap 2000; McCright and Dunlap 2003). This opposition speaks out stridently against the aforementioned consensus in climate science, and through this privileged access and power, has amplified uncertainty on human contributions to climate change by constructing the argument that human's role is negligible. Freudenburg (Freudenburg 2000) discusses embedded power and leveraged legitimacy enabling privileged constructions of 'non-problematicity' in environmental issues more broadly. In their research, McCright and Dunlap examined three major counter-claims: 1) the evidentiary basis of global warming is weak/uncertain/flawed; 2) global warming will have substantial benefits; and 3) climate policy action will do more harm than good. They also examined links between contrarians and conservative think tanks, anti-environment movements and carbon-based industry. They focused on five prominent contrarians – S. Fred Singer, Robert Balling, Sallie Baliunas, Richard Lindzen, and Patrick Michaels. They juxtaposed their influence with the work and influence of five prominent climate scientists – Stephen Schneider (Stanford University), F. Sherwood Rowland (University of California-Irvine), Bert Bolin (former chair of the IPCC), James Hansen (NASA Goddard Institute for Space Studies), and Benjamin Santer (Lawrence Livermore National Laboratory). Among their results, they found that in the early and mid-1990s, these 'contrarians' gained increased visibility in seven major newspapers – the *Los Angeles Times*, the *New York Times*, the *Wall Street Journal*, the *Washington Post, USA Today*, the *Chicago Tribune* and *Newsday*. Furthermore, findings showed that these dissenters successfully developed legible and competing discourses to disempower top climate science, and effectively gain a foothold in national and international discourse on the causes of climate change (McCright and Dunlap 2000; McCright and Dunlap 2003).

To date, there is little peer-reviewed work that has examined how climate NGOs have influenced climate change discourse via the mass media. However, a key study of NGOs in debates on environmental science and knowledge inform the case of climate change. For instance, researchers conducted twenty-one semi structured, in-depth interviews with UK NGOs around the issue of waste – Greenpeace, Friends of the Earth, World Wildlife Fund, Green Alliance, Women's Environmental Network, Forum for the Future, the National Society for Clean Air, the Environmental Services Association, Business in the Environment, the Industry Council for Packaging and the Environment, and the Paper Federation. Their findings show that while NGOs still rely on the authority of science, the more contemporary spaces of science-policy interactions (see above on 'the second wave of science studies') allow for greater NGO access as legitimate claims-makers. In drawing lessons from their case-study, the authors make the point that across other environmental issues, "many challenges are not strategic but *contextual*…expertise built around one boundary does not automatically transfer to another" (Eden, Donaldson et al. 2006:1074, emphasis added). This analysis, along with others (e.g. (Yearley 1996) help illuminate ongoing challenges as well as opportunities facing traditional as well as emergent actors in the arena of media and climate science-politics.

More specific to climate change, Newell has examined the role of environmental pressure groups in shaping the climate policy terrain. He focused on the Climate Action Network, which is a consortium of over sixty NGOs such as Greenpeace, World Wildlife Fund and Environmental Defense. He found that environmental NGOs "constitute an important force for political change by helping to overcome social inertia and bureaucratic resistance to policy (action)" (Newell 2000, 152). As this NGO voice has grown, some scientists and journalists have raised concern in recent months

regarding NGO movements that push climate change discourse in the media beyond the parameters of what science can currently claim. This has been characterized in various ways such as 'catastrophism' by Mike Hulme, Director of the Tyndall Centre for Climate Change Research in the UK (Hulme 2006) or 'alarmism' in the IPPR report 'Warm Words' (Ereaut and Segnit 2006) or 'climate fundamentalism'. Hulme has written:

> Climate change is a reality, and science confirms that human activities are heavily implicated in this change. But over the last few years, a new environmental phenomenon has been constructed in this country – the phenomenon of 'catastrophic' climate change. It seems that mere 'climate change' was not going to be bad enough, and so now it must be 'catastrophic' to be worthy of attention. The increasing use of this pejorative term – and its bedfellow qualifiers 'chaotic', 'irreversible', 'rapid' – has altered the public discourse around climate change…it seems that it is we, the professional climate scientists, who are now the (catastrophe) skeptics. How the wheel turns…" (Hulme 2006)

However, (perhaps to justify 'alarmist' NGO work to motivate action) previous work has revealed the effectiveness of such movements. A study of media coverage of global warming – in the *New York Times*, the *Toronto Globe and Mail*, *Time*, *Newsweek*, the *Economist*, *Science*, *Nature*, and *the New Scientist* – from 1987 into the early 1990s found that "social scares…accelerate political demands, (and) can be important sources of social change" (Ungar 1992, 497). Thus, the terrain of science, policy and the public via in the media in the issue of climate change – both mitigation and adaptation – remains a dynamic and contested one.

Overall, this section has examined the third 'phase' of communication: citizen awareness and engagement in the private sphere. We have surveyed how people interpret the influences of actors such as climate 'skeptics', and how citizens process communication of uncertainty vis-à-vis public trust. The material covered above is contested and debated in a number of ways, thus complicating efforts to be able to clearly and specifically recommend how media can better frame climate change issues – both mitigation and adaptation – in order to increase public understanding and action. For instance, a story on the plight of polar bears in the Artic can be inspiring to some people who put great value in biodiversity, yet could be off-putting to others who put particular value in the plight of human inequality (such as poverty in the Global South). Or, some stories framed as 'what one can do to combat human contributions to climate change' can be mobilizing for some segments of society to take action, yet can be de-mobilizing for others who do not have the tools, access or capabilities to make such changes. In other words, it is a complex set of interactions through time with no particularly easy answers. That said, there are some more straightforward steps that many communities, broadly construed, can take to help improve interactions. For instance, journalists can work to place stories in greater 'thematic' context, instead of moving from story to story in an 'episodic' manner (see discussion in the first phase above). Moreover, journalists can work to label those quoted so as to make more clear to readers which statements could be influenced by special interests. For scientists, more consistent interactions with journalists and policy actors can improve background understanding of each of the groups about others. Furthermore, scientists can think more deeply about accurate metaphors and analogies that they can use in order to more effectively communicate their findings (and thus translate their work more effectively to the public). Policy actors as well as public citizens can improve their scientific literacy in order to more capably interpret news reports on the science of climate change, as well as stories on climate change mitigation and adaptation. These activities and endeavors can then help to improve public receptivity and engagement with climate change science, mitigation and adaptation strategies via mass media. In sum, the material covered above helps to inform how these complex processes unfold. These three phases of analysis now move discussions into the penultimate section of the paper. This section examines the history of

foreign aid for climate change, and reviews a series of studies on how reporting on disasters has driven aid agency budgeting.

Media and foreign aid

Since World War II, foreign aid has repeatedly been promoted as a key part foreign policy: as either a sound investment in national security, in addressing global issues like diseases and political instability, or for some as part of the need for international redistribution of wealth. In 1970 before the UN, the major wealthy nations of the world promised to raise Official Development Assistance (ODA) to over 0.7 percent of their Gross Domestic Income. However, only a couple of countries have managed to do so, and some for only a few years. Rather, domestic demands repeatedly take the will of politicians to send taxpayer funds to needy people abroad (who do not vote nor protest outside the presidential palace). Still, development finance flies largely below the radar until a humanitarian disaster, a campaigning organization, and the media combine to raise the issue to national attention and pressure on funding agencies. Occasionally there are academic studies and editorials about the ineffectiveness of aid (e.g. Easterly 2006; Burnside and Dollar 2000). These, however, often lead to only marginal changes in aid funding. Major efforts like Live Aid and AfricaAid require substantial effort to pull off. They sometimes succeed in the important task of raising consciousness about the need for international aid, but they just as often leave little of lasting impact.

Aid comes in many forms, and each has important implications for adaptation to climate change. Historically, the most funding went to "infrastructure aid" (Hicks et al. 2007). These include roads, dams, and electrical energy generating systems: the most basic needs for further development. Much aid has been directed at promoting the increase of exports from development counties, based largely on the principle that these countries should trade on their "comparative advantage" in resources, land, cheap labor, and tropical climates. Thus, aid agencies have funded the technical advice and inputs for farmers to produce traditional and "Non-traditional Agricultural Exports" (NTAEs) for marketing largely in wealthy nations. Products like fresh fruit and vegetables, cut flowers, aquaculture-raised shellfish and meats all required significant investments for their production, processing, licensing, labeling, transport and marketing in stores thousands of kilometers away. These products often require sanitary facilities for production, constant refrigeration, and highly coordinated lorry and air transport logistics. The impacts of NTAEs have been substantial, but the effects of climate change on these food systems are highly understudied. Many of these crops are far more water and agro-chemical input intensive than the crops they have replaced, but, aid has often assisted in building irrigation systems which reduce risks in the short term, at least. However, marketing abroad has its own risks, as seen in some nations where some segments of consumers are shunning products with what they perceive as embodying "high food miles" or a poor "carbon footprint." For example, an October 2006 report by the International Institute for Environment and Development estimated that 50-60,000 small producers and another 50-60,000 employees were gaining their livelihoods from the sale of fresh fruit and vegetables to the UK alone (MacGregor and Vorley 2006). Including dependents and service providers for the industry brought the estimates of the industry's impact to 1-1.5 million people. The concern is that efforts made to improve development benefits of exports (such as "fair trade" and "organic" labeling) will be undermined by climate change concerns of consumers.

The media has played an important role in amplifying NGO concerns about international financial institutions (IFIs) like the World Bank and the International Monetary Fund. Starting in the 1980s, protests by the Rainforest Action Network, Friends of the Earth, the Sierra Club, and Conservation International (among others) focused on the banks' funding "mega projects" set up to

extract the natural resources or transform their natural landscapes with huge infrastructure projects like dams, mines, highways, airports, and vast agricultural schemes. For example, the Polonoroeste and Carajas projects in the Brazilian Amazon came under intense scrutiny in the mid- and late-1980s and threatened cuts to those agencies' funding sources (e.g. the U.S. Congress and the European Commission) drove some substantial reforms (Keck and Sikkink 1997; Neilson and Tierney 2003; Hicks et al. 2007). Campaigning environmentalist and social justice groups have periodically continued to target high-profile funders of international development, especially the World Bank, the IMF, and the regional banks (ASDB, ADB, AFDB, etc.). As a result, aid for infrastructure has been flat for two decades at about 30-40 billion a year, but represents a greatly diminished share of aid, as social, financial sector support, and environmental aid have all increased (Figure 8) (Hicks et al. 2007).

A few scholars have documented the role that the media plays in driving the allocation of foreign assistance to developing countries. Douglas Van Belle and his colleagues have studied patterns of aid allocation in France and Japanese donor agencies, finding in each case that disaster aid has tended to follow patterns of reporting in major newspapers such as *Le Monde*, *Asahi Shinbun*, and *The New York Times*. Rioux and Van Belle found that on average, one article in *Le Monde* "correlates with an additional US$77,000 in aid" to a recipient nation (Van Belle et al 2004). Each *New York Times* article was correlated with US$1.2 million in aid (Van Belle, Drury, and Olson 1999). Both total foreign aid and disaster aid showed positive correlations with newspaper and TV coverage in the U.S. (Van Belle 2003). For the analysis of Japanese aid, they broke coverage into total coverage of developing nations, negative coverage, unrest, need and positive and neutral coverage (Potter and Van Belle 2004). Press coverage was significantly related to *grants*, but not loans.[10]

Based on these studies in Japan, France and the U.S., and ones in Canada and Britain, Van Belle and others argue that newspaper coverage of development issues influences bureaucrats who carefully watch issues in key daily papers. Potter and Van Belle argue that the relationship is reciprocal—that bureaucrats influence the media at the same time as media coverage influences aid flows. Rather than setting the agenda on aid, they and other authors argue that the Japanese media served a greater role in maintaining support for this funding. Media is often used as a bellwether of public opinion in an area about which little is known, and bureaucrats seek to avoid internal and public critique by allocating aid where the media is focusing. Studying 5,000 natural disasters between 1968 and 2002, Eisensee and Stromberg found that only10 percent were covered on the evening news broadcasts of major networks in the U.S. (ABC, CBS, NBC and CNN), and only about 20 percent received funding from USAID Office of Foreign Disaster Assistance (Eisensee and Stromberg 2007). There were massive imbalances in coverage of different disaster types: "for every person killed in a volcano disaster, 40,000 people must die in a drought to reach the same probability of media coverage." This is explained because famine is a 'slow onset' disaster, with little immediate and new dramatic footage of damage and suffering (see also Olsen et al. 2003), but race, class and region also play a key part. Stunningly, it requires 40 times as many killed in an African disaster to achieve the same expected media coverage as for a disaster in Eastern Europe of the same type and magnitude" (Eisensee and Stromberg 2007, 3, but see Mozambique case below, and Olsen et al. 2003). Timing of a disaster was critical: occurring at the same time as other news crowding events like the Olympics made it much less likely a disaster would receive news attention and humanitarian disaster relief funding. "To have the same chance of receiving relief, the disaster occurring during the highest *news pressure* must have six times as many casualties as the disaster occurring when *news pressure* is at its lowest, all else equal" (Eisensee and Strömberg 2007) (22-23, emphasis in original). These findings

[10] GNP, trade, and East Asia variables were held constant.

were quite similar to a 2006 CARMA International study showing "no link" between the scale of a disaster and media interest in the story." Further, most disaster coverage focuses on the suffering, and only a small proportion mentioned international relief efforts (CARMA 2006; Van Belle 2003).

Hicks et al (2007) have shown that overall, environmental aid in general is driven by geopolitics and history as a colony of donors as much as environmental needs of recipient nations. Two of the best predictors in a multivariate model of environmental aid allocation from bilateral donors was whether the recipient nation had voted with the donor nation in the U.N. General Assembly, and whether the recipient was a colony of the donor (see Kuziemko and Werker 2006). The pattern varies, of course: Olsen et al. (2003) report that big donors like the U.S., France, UK and European Union use aid to serve their interests, whereas smaller donors (esp. Scandinavian countries) base funding on needs of recipients. The use of aid to "buy votes" has been recently admitted by Japan's ambassador to New Zealand Masaki Saito, who confessed to their use of donations to Pacific Island nations to gain votes in the International Whaling Commission and attempt to overturn a decades-old ban on whaling. He said bluntly "…overseas aid is very good leverage so they can support our positions in general, including whaling." (Associated Press 2003). Japan's environmental profile has been much disputed, since decades of international action was based plainly on securing access to natural resources and increasing its global and regional power (see box). In the late 1980s, Japan made significant about faces, including on environmental policy and the provision of aid for environmental projects around the world (Hicks et al 2007; Kim 2006). Aid agencies have been under pressure to show they are "doing something" about the environment, but this funding is constrained for a number of reasons. Aid explicitly designed to address environmental problems has risen somewhat over the last few decades, but has largely leveled off at about ten percent of foreign aid (Hicks et al, 2007; Figure 7 below). A second factor is that since sewage, water projects are so expensive, and because host governments most openly welcome such investments/aid, they tend to get the vast majority of aid funding. Climate change aid meanwhile remains a small part of that aid, reaching 1-2 percent of total foreign assistance over the past two decades. Further, aid for adaptation to climate change has been a tiny part of environmental aid. Since the "debt crisis" of the early 1980s, much attention by campaigning social justice and environmentalist NGOs has focused on the large IFIs' demands on poor nations to cut public funding for basic necessities and for their insistence on the privatization of basic services like water and health care. "IMF Riots" were documented around the world (Walton 1989). This combined with the pressure on aid agencies to stop funding environmentally damaging infrastructure projects may be seen as driving an increase in funding for "social" projects, including health care, education, government reform/capacity building, and agriculture (Figure 9). Not much of this debate has concerned adaptation to climate change; in fact, the coverage on adaptation to climate change in developing countries has been quite slim (see Liverman and Vilas 2006).

After years of broadcasting images of starving babies on desolate African plains, "donor fatigue" has led many non-profits and international aid agencies to develop softer-edged requests for aid. While popular media reporting on climate change continues to focus on apocalyptic report after catastrophic prediction, there is a similar attempt to shift coverage to include some hopeful solutions that do not leave viewers or readers at the point of despair and inaction. For example, pre-Christmas appeals in UK newspapers called for modest donations to climate adaptation projects helping Andean and Himalayan families set up renewable energy systems and use more efficient wood stoves, saving tremendous ecological damage as well as time and effort previously spent hacking down natural forests and hauling back the wood.

InterAction, Global Health Council, Bread for the World and BetterSaferWorld.org commissioned a 2004 study in the U.S. on *Developing Messages about Humanitarian and Development Assistance* conducted by marketing firm Lake Snell Perry and Associates. Based on polling data and "message testing studies" from 2002 to 2004, they found that U.S. citizens believe the country should help the poor countries, but were "concerned about cost and effectiveness." There was marked scepticism about government-to-government aid, but "Coalitions of NGOs" were seen as trustable. Positive language telling success stories and "helping individuals and communities help themselves" were seen to be more effective than scolding comparisons of American aid levels or images of suffering children. Seventy-one percent of respondents said that U.S. government aid "assisting people in countries that are suffering from natural disasters" was very important, but it was fifth in a ranking, below preventing terrorism, education, and equality for women and girls. On the other hand, it was first in a ranking of what were likely to be *achievable* goals.

No solid estimates exist on how much aid will be needed to assist developing nations in adapting to climate change. Muller and Hepburn (2006) argue that we have at least an indication of the order of magnitude for such an estimate, which they put in the area of $10 billion a year. They base their argument on the congruence of two estimates, one from Ian Noble at the World Bank and the other from their own extrapolation based on the first National Adaptation Programmes of Action (NAPAs) prepared by Less Developed Countries (LDCs) as part of their participation in the UN Framework Convention on Climate Change. Both, in our opinion, are extremely inadequate, but require attention. The World Bank estimates are the roughest, based on the examination of 50 projects of all types in 2003 and 2005, and an estimate on a 5-point scale of whether they were likely to be highly vulnerable to climate change. Overall, they estimated that of the $100 billion of ODA and concessional finance, 25-50 percent was "climate sensitive," and that adapting these projects to possible climate risks would cost about 10-20 percent of project costs. This leads to an estimate on the order of $4-8 billion a year to make current aid projects less climate vulnerable. They also provided estimates of the proportion of foreign private investment and domestic spending that will be needed to be "climate proofed" in LDCs to adapt to climate change, at levels around 2-10 percent of investments. This came to another $5- $33 billion a year. So adding these two numbers, Noble arrives at ranges of $9-41 billion a year. Note that this is only current projects, and does not address the "stock" of infrastructure or institutions that would need to be addressed.

Muller and Hepburn (2006) also develop estimates based on the five National Adaptation Programmes of Action (NAPAs) which were available at the time of writing of their paper. (The current number of NAPAs on the UNFCCC website on 4 March 2007 is thirteen). They found $131.5 million in adaptation projects listed in the NAPAs from Bangladesh, Bhutan, Malawi, Mauritania, and Samoa. Extrapolating to the Least Developed Countries, the G77 and China, and to all non-Annex-I nations, by population, GDP or land area, they developed an estimate of the funding needed to adapt to climate change between $5 and 9 billion per year. DFID, Oxfam, and other organizations are seeking to "climate proof" their portfolios of development projects; their estimates of how much this might cost may be enormous improvements over the top-down World Bank, and Muller and Hepburn's NAPA-extrapolation estimates. A Tyndall Centre study reviewed "portfolio screening" of the climate sensitivity in development assistance at six development agencies: the World Bank, Norway, DFID, have screened their project portfolios (Klein et al. 2007). They found a shortage of good information inside agencies and a serious neglect of possible damage to initiatives from future climate change.

Available funding for adaptation to climate change is grossly insufficient. There are four funds under the UN Framework Convention on Climate Change and Kyoto Protocol. The Least Developed Country fund recently stood at $68.3 million total pledged and provided. The Special Climate Change

Fund was $56.5million, and the GEF Special Priority on Adaptation trust fund stood at $50 million. This totals under $300million total (not annually) voluntarily pledged for adaptation to climate change since 2001. The Adaptation Fund had donations of only $5 million, but is projected to grow substantially with a 2 percent levy on the sale of carbon emissions reduction credits through the CDM (Clean Development Mechanism). With a 2 percent levy, the 500 projects approved by the U.N. by February 12, 2007 will generate only about $3-12 million for the adaptation fund. Projections for the adaptation levy on the CDM vary wildly, from a total of $160 million to 950 million over the period from now until 2012. Based on carbon permits at $5-10 a ton, our estimate is at the low end of this scale: $180-360million.

One major problem with aid for climate adaptation has been defining what international donors should pay for. Years of debate have focused on whether donors should cover only costs "additional" over what would have been done anyway, and only for "global" environmental benefit. Adaptation financing is available only for incremental costs due to climate change (Muller 2007).

There are some possible sources of new funds (beyond the CDM tax): among them are a global carbon tax, more Official Development Assistance, an extension of the 2 percent levy to all carbon trading, and a levy on international air travel have been proposed. The airline levy idea of Muller and Hepburn is most similar to France's solidarity levy on airline travel. Three years ago, France unilaterally created a "solidarity levy" for HIV/AIDS funding to Africa financed by a progressive levy on airline travel (Leading Group 2006; Landau 2007). All these proposed means of generating the billions of Euros needed for adaptation to and/or compensation for climate change damage raise issues of what kind of public education campaign would be needed. National promotional organizations were set up by development agencies or NGOs in the 1970s in many donor nations, but development education efforts have waxed and waned over the past three decades, mostly falling into neglect in the 1990s. The new French airline levy recognized the important role of the media in supporting this new tax: the start-up of the levy was accompanied by release of stories to the press of the need and efficacy of this aid, and ticket-buying passengers were given literature to the same effect. The strategic decision on the levy was to focus it intensely on a narrow set of initiatives providing key medicines through a new, streamlined, agency called UNITAID.

One major advantage that raising funds for climate change adaptation and compensation may have over broader development appeals is the more direct connection between the actions of people in wealthy countries and the suffering of those in poor nations. For example, taking a long-haul airline flight will create a measurable increase in greenhouse gases in the atmosphere, which will add to problems in poor nations. This is an intuitive application of the "polluter pays principle:" placing levies on key carbon-intensive actions on the basis of compensation and assisting adaptation. The paying of voluntary carbon offsets by some airline passengers suggests the potential acceptability of these new fees, and concerns about their legitimacy suggest the need for rigorous independent monitoring and long-term control. Aid generated by taxing carbon-intensive consumption ties the largest big emitters to the resolution of a "global public bad" (climate change), which affects everyone. Still, adaptation funding may be seen by some as a "local" public good, so substantial education on this will be required. For us, this points to the need for a compulsory funding mechanism.

Case Study: Japan – A Donor Who Has Rapidly Switched to Attention to Environmental Issues

Japan started out as an aid recipient with its economy in ruins after WWII, but its recovery (with help from Western assistance) was so rapid that twelve years after the wars' end, in 1957, it was

prepared to begin giving aid itself. From the beginning, Japanese aid was plainly described as a tool to help achieve Japan's foreign policy aims. Among these aims were acceptance by other rich donor countries; mending political ties broken in WWII; and fostering pro-Japanese attitudes in countries that exported many raw materials to Japan (Rix 1980; Arase 1995). Japanese aid became notorious for being composed mostly of loans instead of concessional grants, being designed for securing access to raw materials, tied to purchases from Japan of equipment and consulting services, and focusing heavily on strategic areas of Asia (Arase 1995, Rix 1980).

Japan is also notorious for its complex and opaque system of aid administration. It has never had a centralized aid agency or ministry; aid today is coordinated between some 13 cabinet-level bureaucratic actors, and technical cooperation, grant aid, and loan aid are handled by separate organizations (Kim 2006).

Japan's concern for environmental aid dates from the mid-1980s, and was a response to international criticism that its aid—focused as it was on heavy industry—contributed seriously to global environmental degradation, especially the destruction of tropical forests (Rix 1980). In 1986 Japan's Overseas Economic Cooperation Fund (OECF) published a report recommending that aid include environmental assessment measures, a recommendation that was echoed one year later by Japan's Environmental Protection Agency. This translated into diplomatic action at the Paris G7 summit in 1989, where Japan made a major commitment to environmental aid of ¥300 billion (about $2 billion in 1990 dollars) over the next three years. In September of 1989 Japan hosted an international conference on environmental protection in Tokyo. Among Japan's chief priorities were the protection of forests, urban anti-air pollution measures, and assisting the LDC's in building resources to manage their own environmental problems, in keeping with the Japanese emphasis on self-help (JICA Annual Report 1993, Rix 1980). Before 1989, there was little mention of environment in the annual reports of the Japan International Cooperation Agency (JICA). Reports after this date, however, all contain strong language on the importance of sustainable development and environmental priorities. The Rio conference in 1992 reinforced this trend, with Japan identifying the environment as a central consideration in policy formulation and making massive new commitments to spend ¥1 trillion ($8 billion in 1992 dollars) on environmental causes over the next five years. Japan also committed to spending on large-scale projects, such as a $500 million loan in 1990 for air-quality improvement in Mexico City, and to aiding middle-income countries that were the worst hit by environmental degradation.

Even when environmental assistance was at its peak, however, it was completely dwarfed by the massive amount of Japanese aid that went for projects classified as likely to be environmentally damaging (Hicks et al. 2007). Infrastructure aid with likely negative environmental impacts did see a gradual drop over the 20-year period, from 71% of total lending in 1980 to 50% in 1999, but even in the mid-1990s this aid made up almost two-thirds of its total aid portfolio. Annual reports from JICA, while consistently emphasizing the need for environmental action throughout the 1990s, never once mention the idea of cutting back on lending to environmentally harmful projects. Japan did attempt to mitigate the destructive effects of projects such as dams, roads, and power plants by sending teams of environmental experts to judge their impacts, but such economic infrastructure projects were too firmly entrenched in Japan's aid philosophy for Japan to consider reducing them (JICA Annual Report 1996, p 24).

Throughout the 1980s, virtually all Japanese environmental projects were for water and sanitation (Hicks et al. 2007). It was not until 1990 that money for environment projects aside from water began to appear. Japanese aid for global public goods like biodiversity conservation and climate change was extremely low until 1992, when it rose to about $350 million a year, and it

reached $500 million in two years later in the decade, 1995 and 1997. The late-90s economic crisis led to deep cutbacks that hurt environmental aid sectors in two ways: funding fell and Japanese aid organizations were so overwhelmed with the Asian financial crisis that environmental issues are not even mentioned in JICA's 1998 annual report, despite having their own section for the previous nine years. Given these trends, and recent admissions about allocating funding for votes on the Whaling Commission (see text), Japan's position as leader in environmental aid is not at all secure.

Case Study: Mozambique's Typhoons and the Media in 2000 – "A model for future cooperation"?

During the fall of 1999 and the first two months of 2000, a series of low-pressure systems and tropical depressions brought record levels of rain and extensive flooding to central and southern Mozambique. These precipitation events were followed by three cyclones: Connie, Eline, and Gloria. Torrential rains caused rivers and dams to brim over in Mozambique, and in Zimbabwe, Botswana, South Africa, and Swaziland. Because of the severity of the flooding, a number of neighboring states decided to release their floodgates, sending "walls of water" into Mozambique (Martin et al. 2001). The result: 700 people dead, 1 million displaced persons, 450,000 homes destroyed, 30,000 drowned cattle, 180,000 drowned chickens, 140,000 lost hectares of farmland (or 10% of the country's cultivated land), severely damaged infrastructure, and a $700 million reconstruction bill for the government (Martin et al. 2001; CRED-OFDA 2005; EIU 2004). The media and aid agencies played a crucial role in the international response to the disaster, which can provide several lessons on the possible future impact of media on climate response.

Mozambique is riddled with institutional and economic problems inherited from its colonial past. In 2000, UN-HABITAT estimated that 94% of the urban population lived in a slum dwelling. That means that close to all urban Mozambicans lack a permanent housing structure that complies with local regulations, electricity and sewer connection, and access to water within 200 meters. According to the most recent figures from the *Global Urban Indicators* database, only 5% of wastewater is treated in Maputo, building codes are not integrated with hazard and vulnerability assessments, and the environmental plan drawn up for the city has not yet been implemented (UN-HABITAT 1998). The absence of these basic protections created ideal conditions for a human disaster when cyclones Connie, Eline, and Gloria arrived in early 2000 (Sidaway and Power 1995, 1469).

Four floods hit Mozambique in the terrible time of January-March of 2000: the first from heavy and early rains brought by climatic shifts under the La Niña pattern, then Cyclones Connie, Eline, and Gloria hit one after another. This description draws heavily on Christie and Hanlon (2001) and personal communication with USAID Director of Natural Resource Management David Hess. In the city of Xai-Xai the Limpopo River waters were 12 feet deep for nearly a month, making it the worst flood in 150 years. The Maputo and Umbelúzi rivers reached serious flood levels, as did the Incomáti, Save, Buzi and Púngoè. On most of these rivers, the flood levels were two or four times what had ever been recorded. It could have been much worse, however. Because of the changing La Niña weather patterns, heavy rains were predicted in Mozambique from September 1999 to January 2000 (Christie and Hanlon 2001, 106-108). Some substantial planning went on to prepare for the floods, and weather forecasters worked to warn residents quite early on. After the early rains, soils became saturated and were unable to absorb more water. Still, the floodwaters swept through neighborhoods "like a monster", entirely engulfing homes, schools, and train stations (Christie and Hanlon 2001, 1). 700 people are believed to have died. Some people

survived by moving up into trees and tying themselves up there, some were stuck there for days or even weeks. They drank the contaminated waters that flowed by, grabbing crops or anything else they could eat. Finally, South African helicopters saved thousands of victims, as television cameras transmitted the dramatic rescues around the world.

In their detailed account of the floods, journalists Frances Christie and Joseph Hanlon argue that the massive outpouring of foreign support during the aftermath of the floods was due to those televised images (2001; Martin et al. 2001). Olsen et al. (2003) describe how reporters had nearly immediate and complete access to the disaster zones and dramatic relief effort: "the world had never before on TV seen a woman give birth to a child in a treetop…never before had TV shown such spectacular rescue." They document how the Mozambique floods received five times the TV coverage in Denmark and the international print press as did the much larger Indian cyclone disaster of 1999, where the media was shut out of disaster zones until international interest had nearly passed. Suggestively, humanitarian assistance was seven times greater for the Mozambique floods. Christie and Hanlon describe a remarkably coordinated effort by the Mozambiquan navy, ten air forces, the Red Cross, and hundreds of other groups who worked together to rescue 45,000 people. Half a million people were supported in hastily constructed "accommodation centres." Diseases and malnutrition were almost entirely averted (Christie and Hanlon 2001, 2.). The Mozambiquan national emergency response agency (INGC) was remarkably prepared, and coordinated the rescue efforts with the help of foreign aid and emergency workers. The UN World Food Program and the foreign assistance groups and air forces applied lessons learned from "coordination failures during Hurricane Mitch and in Albania." Christie and Hanlon report that the response to the 2000 floods in Mozambique was the "largest air rescue operation ever mounted" and "will be a model for future cooperation between humanitarian agencies and military forces" (Christie and Hanlon 2001, 4).

Conclusions

Overall, in the milieu explored in this document, it has been important to investigate mass media's portrayal of climate change/global warming mitigation and adaptation. It has also been worthwhile to consider the role of media coverage as it relates to science and policy. In discussing mass media influence, Bennett has said, "Few things are as much a part of our lives as the news…it has become a sort of instant historical record of the pace, progress, problems, and hopes of society" (Bennett 2002, 10). The survey above aims to help make sense of current trends, strengths and weaknesses of media representations of climate change, and thus assist in identifying and supporting potentially effective links that can be made to ongoing challenges of climate change mitigation and adaptation communications, as well as human development pursuits with the UNDP.

This paper set out to raise a series of questions and point a few directions in beginning to answer them: What role do the media play in influencing personal, national, and international action to address climate change? How much has the media covered climate change, and what is driving changes in that coverage? How do climate change stories come to be reported, and who gets cited as legitimate sources in those stories? What influence do the media play in forming public opinion? And a new awareness is to grow of the need for large amounts of foreign aid to help poor nations adapt to climate change, then what role can the media playing in mobilizing that aid?

The core of the paper uses Carvalho and Burgess'(2005) framework of the "three phases" of news production, public discourse, and media consumption and personal engagement with climate change. In the first phase we described how large-scale economic and political factors shape the production of news, as well as the norms and needs of journalists, editors, and producers such as

novelty and balance. In the second phase, we described how climate news stories compete (often weakly) with other more immediate issues for public attention, and how this leads to their marginality in national budgets, as public officials face voters concerned with local issues like crime and jobs. Anthony Downs' "Issue Attention Cycle" would lead one to expect climate change to quickly rise and fall as a hot news story, but the issue continues to garner huge amounts of coverage, and there is significant debate in the "Public Arenas" about what the scientific findings mean. The third phase examined citizen knowledge and engagement with the issue of climate change, and the influential role of climate 'sceptics' in paralyzing action. Even without uncertainty about the human causes of climate change, people are often demobilized by feelings of isolation, hopelessness, powerlessness and lack of public trust in government to effectively address the issues. We then examined the history of foreign aid for climate change, and reviewed a series of studies on how reporting on disasters drives aid agency budgeting.

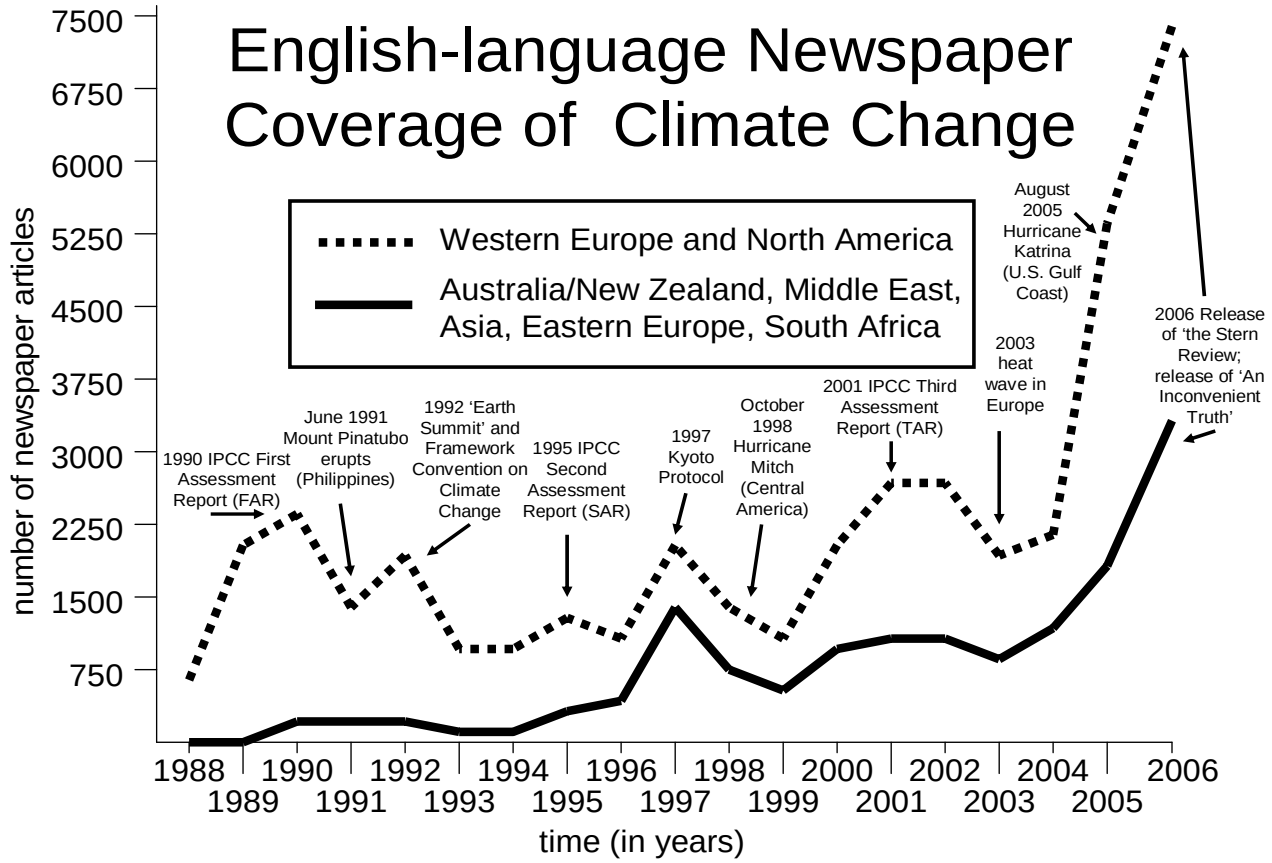
One could summarize from this review that the media has at times kept the issue of climate change alive, but has also limited the extent to which real change in the organization of society and foreign assistance have been called for. To put it plainly, the press has been quite reformist in its portrayal of the needed action on climate change, when the scientific projections suggest the issue may call for truly revolutionary changes. The difficult position of the media in capitalist society is that commercial news outlets require huge amounts of advertising to pay their salaries and other expenses, and the greatest advertisers are for automobiles, real estate, airlines, fast food, and home furnishings. To create demand for real mitigation of climate change emissions would require the media to repeatedly and insistently call for truly revolutionary changes in society, precisely away from consumption of the products of their advertisers. By comparison, creating pressure for the allocation of significant resources for adaptation to climate change will be relatively less threatening to the system that supports these media outlets. Whether that allocation will include sending funds to poor nations, of course, remains to be seen. To date in the studies and analyses outlined above, in some cases the media has been demonstrated to actually have played a role in hampering accurate communications about climate science to policy actors and the public via the media (e.g. Boykoff and Boykoff 2004). However, in other cases the role of mass media in communicating climate science, mitigation and adaptation has been mixed or more positive (e.g. Boykoff and Boykoff 2007). Thus, through the rich and broad range of studies outlined in this background paper, one can conclude that many challenges as well as opportunities lay ahead. Throughout the paper, we have sought to provide insights and details that substantiate this ultimate point.

There are clear needs for further research in this arena of climate science-media-policy/practice, as mentioned throughout this background paper. There are numerous areas where this can (and should) be pursued. For instance, there simply needs to be more research specifically examining media coverage of climate change adaptation. To date, the aforementioned studies in this background paper have focused on either climate change generally or climate change mitigation (for example coverage of diminishing human contributions to climate change). Moreover, there is a clear need for more of this work to be extended into other countries, such as China, India and Brazil. Boykoff has examined U.S. and UK media coverage of climate change, and this survey notes other prominent studies also undertaken in the U.S. and UK, as well as countries such as Germany, France, Australia and New Zealand. However, analyses of media coverage in key countries in ongoing UN international climate policy negotiations can help to clarify ongoing impediments as well as enhance actions. There appears to be a new impulse of scientific and press coverage on the need for massive foreign assistance for adaptation to climate change, growing in part from the April 2007 release of the second Working Group of the IPCC's report on climate change impacts, adaptation, and vulnerability

(IPCC WGII 2007). For instance, Revkin's *New York Times* article 'Poorest Nations Will Bear Brunt as World Warms' has recently drawn greater media attention to the issues of inequality, climate change, adaptation and human development (Revkin 2007a). This was the case also with the follow-up piece entitled, 'The Climate Divide: Wealth and Poverty, Drought and Flood: Reports from Four Fronts in the War on Warming' (Revkin 2007b). The question is whether this new understanding of the need for adaptation will result in sustained and effective media coverage of the issue, increases in citizen action, NGO activity, national policymaker initiatives, and international agreement.

Overall, the tools gained from the mapping of the terrain and the literature in the field of media coverage of climate change will help to identify key trends, strengths and weaknesses. It has been a challenging task for mass media to effectively cover this complex issue of climate change. As outlined throughout this document, there are external and internal pressures at multiple scales, both in the public and the private spheres over time. While reporting on the physical science has improved in recent years, coverage of the complex biological and human processes and activities (such as adaptation) is just emerging. Moreover, while coverage has focused on technical aspects (such as carbon sequestration), it has been more difficult to effectively cover moral, ethical and cultural issues. However, given the increase in quantity of climate change coverage overall, there are more spaces for quality coverage in these arenas. Many of these pressures and factors have proven contradictory (for example dealing with consumption questions amid corporate capitalist media organization pursuits) but some can be optimistically viewed as complementary (such as increased public attention on the issue and thus greater individual and well as collective engagement with the challenges therein). This background research aims to assist in the challenges of grappling with ongoing and interacting human-environment issues, such as climate change, adaptation and human development.

FIGURE 1: English-language newspaper coverage of climate change/global warming

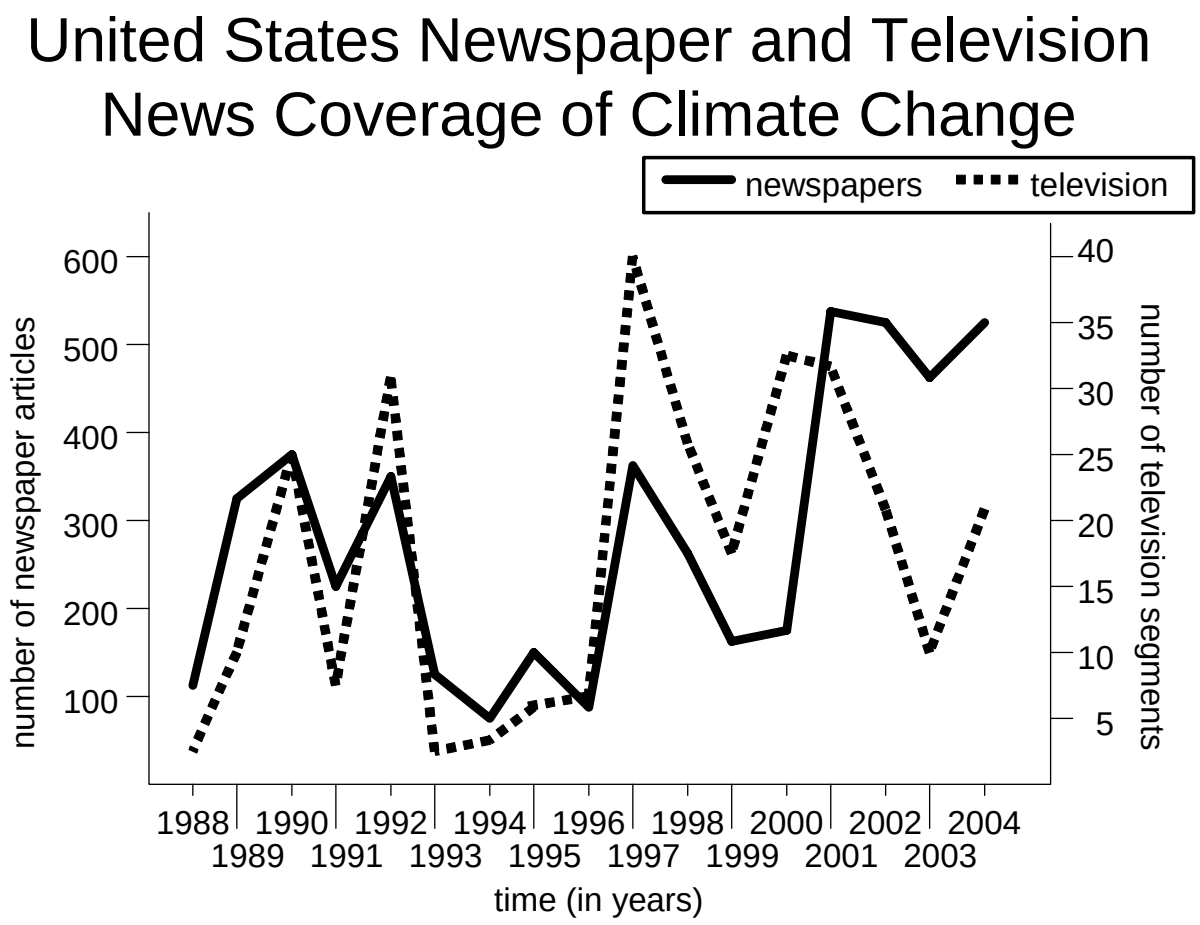


This notes the increases in quantity of coverage of climate change and adaptation over time, also noting particular events, meetings and reports related to climate science and policy/politics/practice.

Note: the newspapers covered were the *Sydney Morning Herald*, *The Age* (Melbourne), the *Courier-Mail* (Brisbane), *The Australian*, the *Daily Telegraph* (Sydney), *Globe and Mail* (Toronto), the *Toronto Star*, the *South China Morning Post* (Hong Kong), the *Prague Post*, the *Irish Times* (Dublin), the *Jerusalem Post*, the *Jerusalem Report*, *Yomiuri Shimbun* (Tokyo), the *Japan Times* (Tokyo), *Mainichi Shimbun* (Tokyo), the *Korea Herald*, the *Korea Times* (Seoul), the *New Straits Times* (Wilayah Persekutuan), *Het Financieele Dagblad* (Eindhoven), the *New Zealand Herald* (Auckland), the *Dominion Post* (Wellington), *The Press* (Christchurch), the *Moscow News*, the *Moscow Times*, *The Straits Times* (Singapore), *Business Day* (Johannesburg), the *Financial Mail* (Johannesburg), the *Sunday Times* (Johannesburg), *The Nation* (Bangkok), the *Guardian* (London), the *Observer* (London), the *Independent* (and *Sunday Independent*) (London), the *Times* (and *Sunday Times*) (London), the *Financial Times* (London), *The Herald* (Glasgow), *The Scotsman* (and *Scotland on Sunday*) (Edinburgh), the *Los Angeles Times*, the *New York Times*, *U.S.A Today* (McLean, VA), the *Wall Street Journal* (New York), and the *Washington Post*.

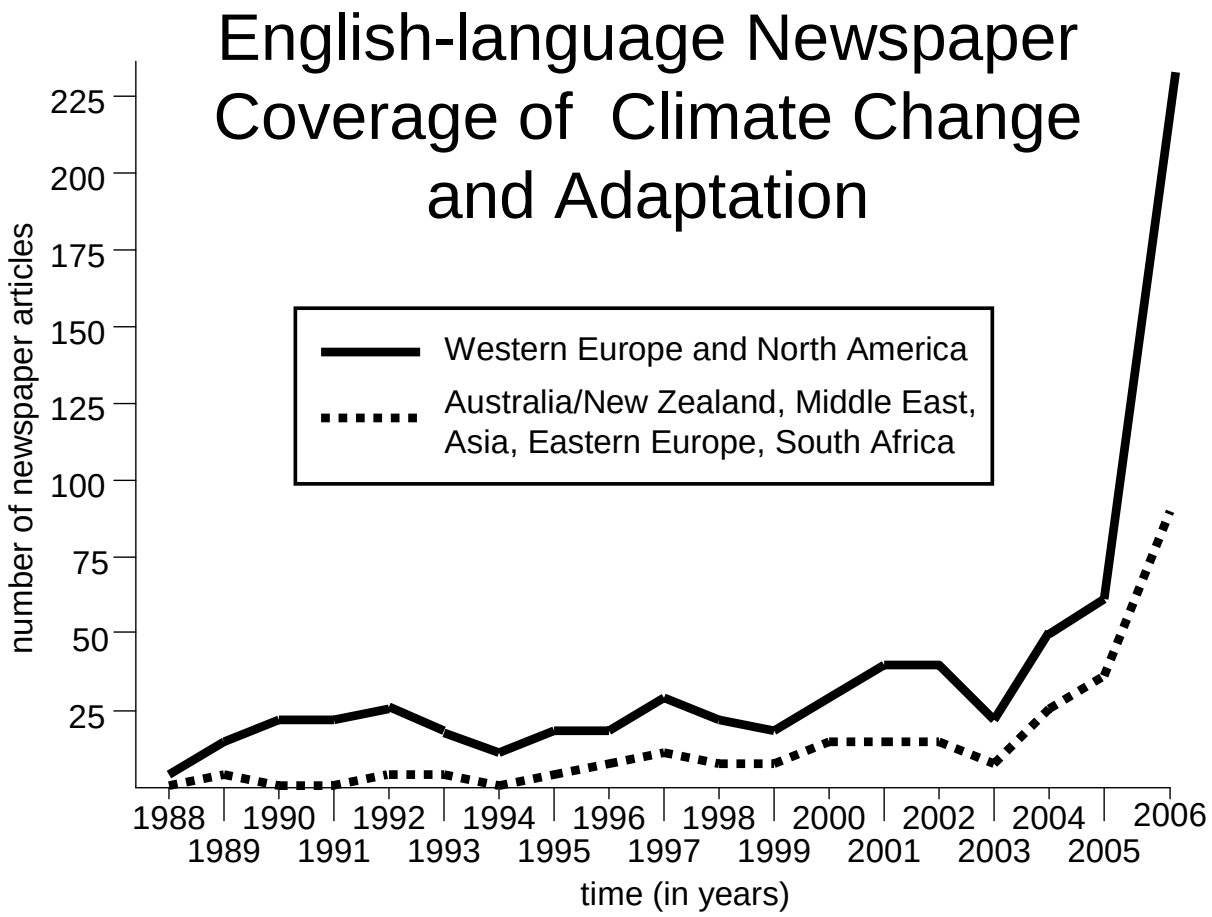
TABLE I:	**Newspapers grouped by country of origin**
Australia	the *Sydney Morning Herald*, *The Age* (Melbourne), the *Courier-Mail* (Brisbane), *The Australian*, the *Daily Telegraph* (Sydney)
Canada	*Globe and Mail* (Toronto), the *Toronto Star*
China	the *South China Morning Post* (Hong Kong)
Czech Republic	the *Prague Post*
Ireland	the *Irish Times* (Dublin)
Israel	the *Jerusalem Post*, the *Jerusalem Report*
Japan	*Yomiuri Shimbun* (Tokyo), the *Japan Times* (Tokyo), *Mainichi Shimbun* (Tokyo)
Korea	the *Korea Herald*, the *Korea Times* (Seoul)
Malaysia	the *New Straits Times* (Wilayah Persekutuan)
Netherlands	*Het Financieele Dagblad* (Eindhoven)
New Zealand	the *New Zealand Herald* (Auckland), the *Dominion Post* (Wellington), *The Press* (Christchurch)
Russia	the *Moscow News*, the *Moscow Times*
Singapore	*The Straits Times*
South Africa	*Business Day* (Johannesburg), the *Financial Mail* (Johannesburg), the *Sunday Times* (Johannesburg)
Thailand	*The Nation* (Bangkok)
United Kingdom	the *Guardian* (London), the *Observer* (London), the *Independent* (and *Sunday Independent*) (London), the *Times* (and *Sunday Times*) (London), the *Financial Times* (London), *The Herald* (Glasgow), *The Scotsman* (and *Scotland on Sunday*) (Edinburgh)
United States	the *Los Angeles Times*, the *New York Times*, *USA Today* (McLean, VA), the *Wall Street Journal* (New York), the *Washington Post*

FIGURE 2: U.S. newspaper and television coverage of climate change



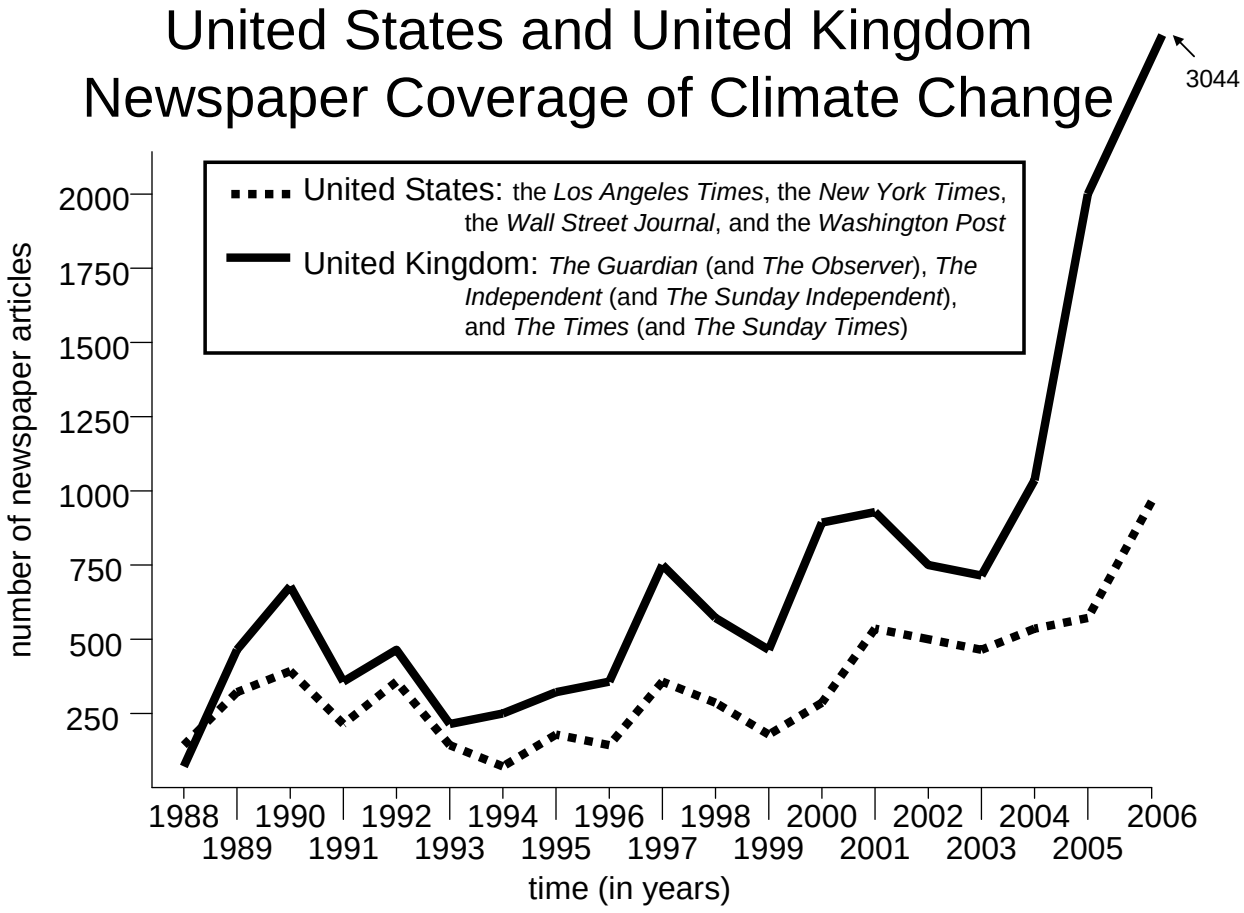
The newspaper examined here are the *Los Angeles Times*, the *New York Times*, the *Wall Street Journal* (New York), and the *Washington Post* and the television programs are *ABC World News Tonight, CBS Evening News, NBC Nightly News, CNN WorldView, CNN Wolf Blitzer Reports and CNN NewsNight* (from Boykoff and Boykoff 2007).

FIGURE 3: English-language newspaper coverage of climate change/global warming AND adaptation



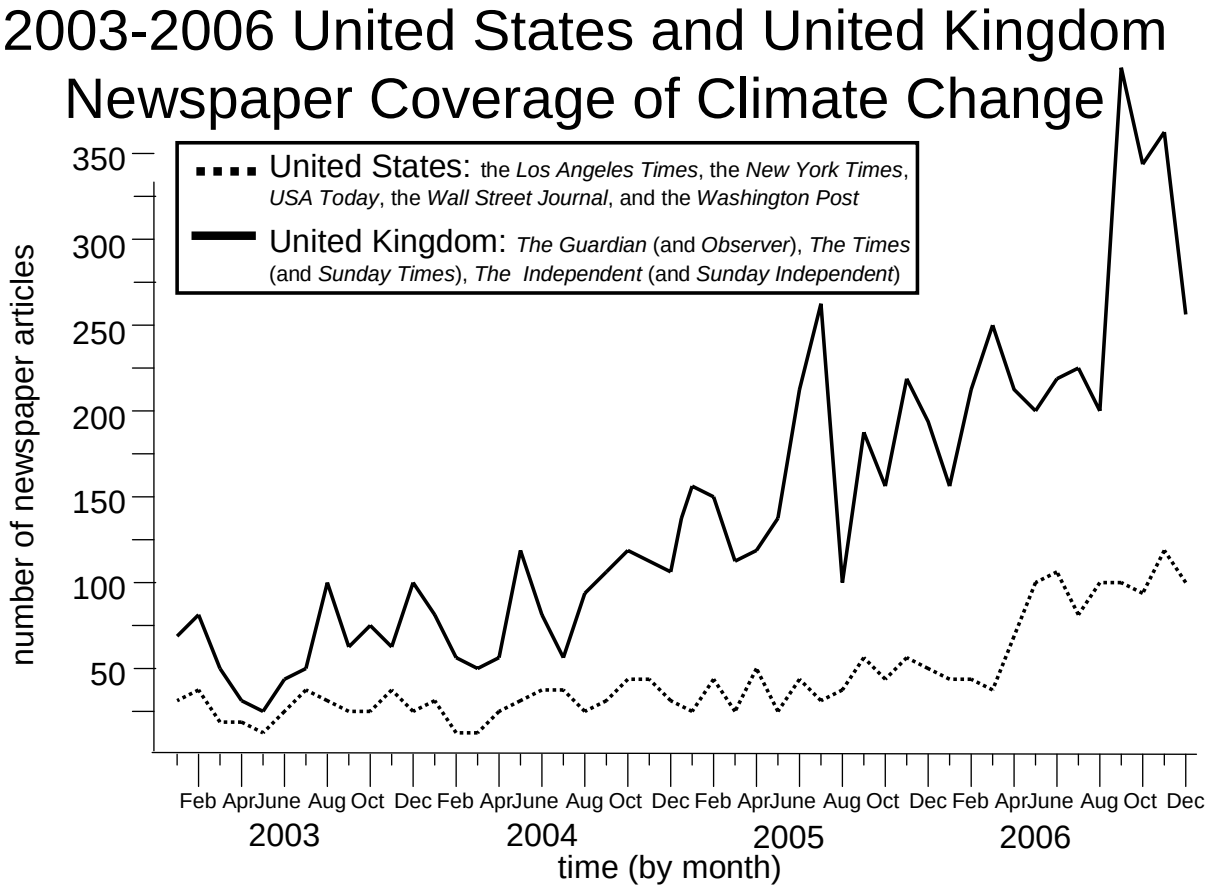
Note: The newspapers covered were the *Sydney Morning Herald*, *The Age* (Melbourne), the *Courier-Mail* (Brisbane), *The Australian*, the *Daily Telegraph* (Sydney), *Globe and Mail* (Toronto), the *Toronto Star*, the *South China Morning Post* (Hong Kong), the *Prague Post*, the *Irish Times* (Dublin), the *Jerusalem Post*, the *Jerusalem Report*, *Yomiuri Shimbun* (Tokyo), the *Japan Times* (Tokyo), *Mainichi Shimbun* (Tokyo), the *Korea Herald*, the *Korea Times* (Seoul), the *New Straits Times* (Wilayah Persekutuan), *Het Financieele Dagblad* (Eindhoven), the *New Zealand Herald* (Auckland), the *Dominion Post* (Wellington), *The Press* (Christchurch), the *Moscow News*, the *Moscow Times*, *The Straits Times* (Singapore), *Business Day* (Johannesburg), the *Financial Mail* (Johannesburg), the *Sunday Times* (Johannesburg), *The Nation* (Bangkok), the *Guardian* (London), the *Observer* (London), the *Independent* (and *Sunday Independent*) (London), the *Times* (and *Sunday Times*) (London), the *Financial Times* (London), *The Herald* (Glasgow), *The Scotsman* (and *Scotland on Sunday*) (Edinburgh), the *Los Angeles Times*, the *New York Times*, *USA Today* (McLean, VA), the *Wall Street Journal* (New York), and the *Washington Post*.

FIGURE 4: U.S. and UK newspaper coverage of climate change/global warming, 1988-2006



(from Boykoff and Rajan 2007)

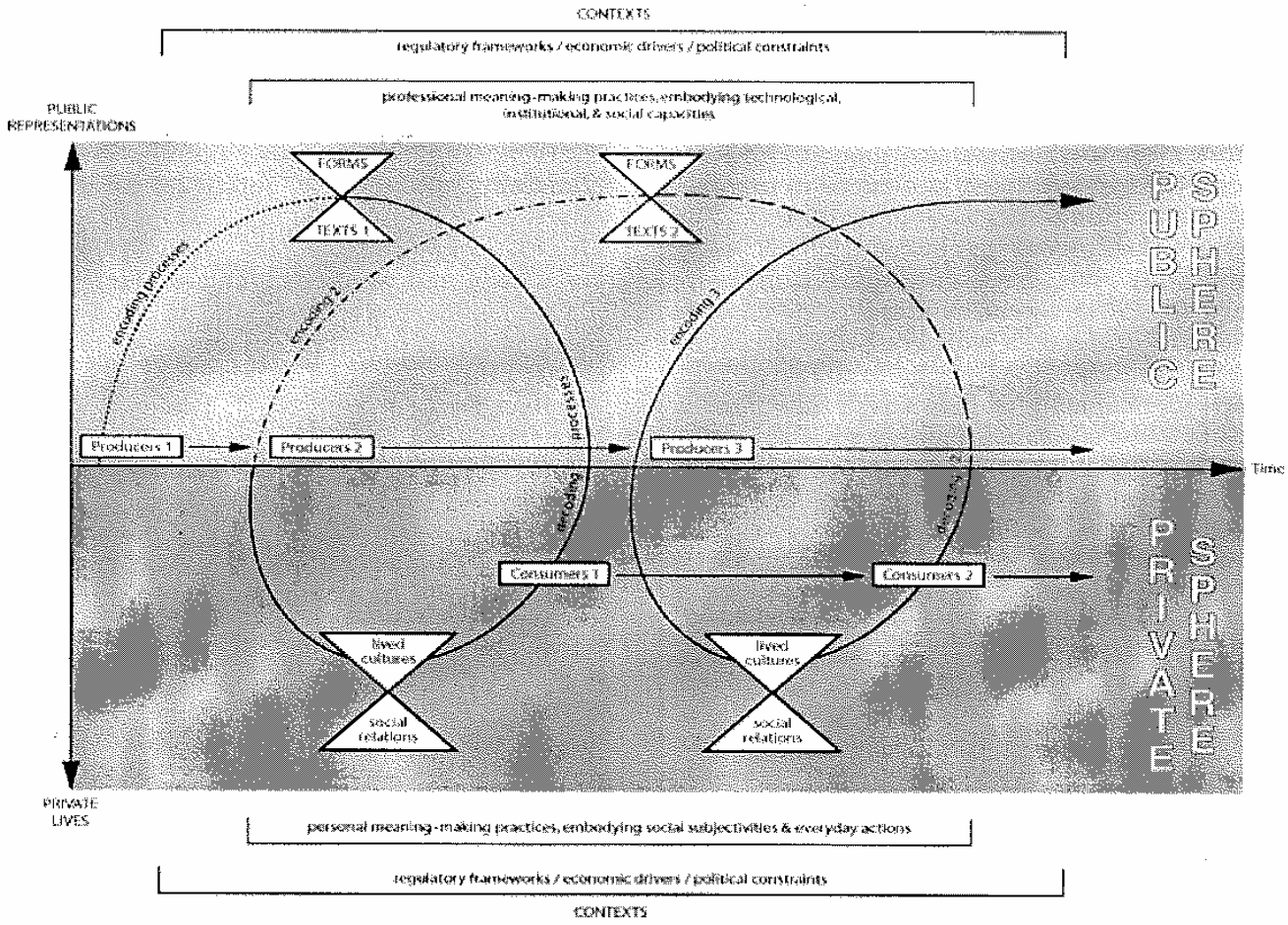
FIGURE 5: U.S. and UK newspaper coverage of climate change/global warming, 2003-2006



This figure tracks variations in the quantity of coverage in the newspaper sources noted above.

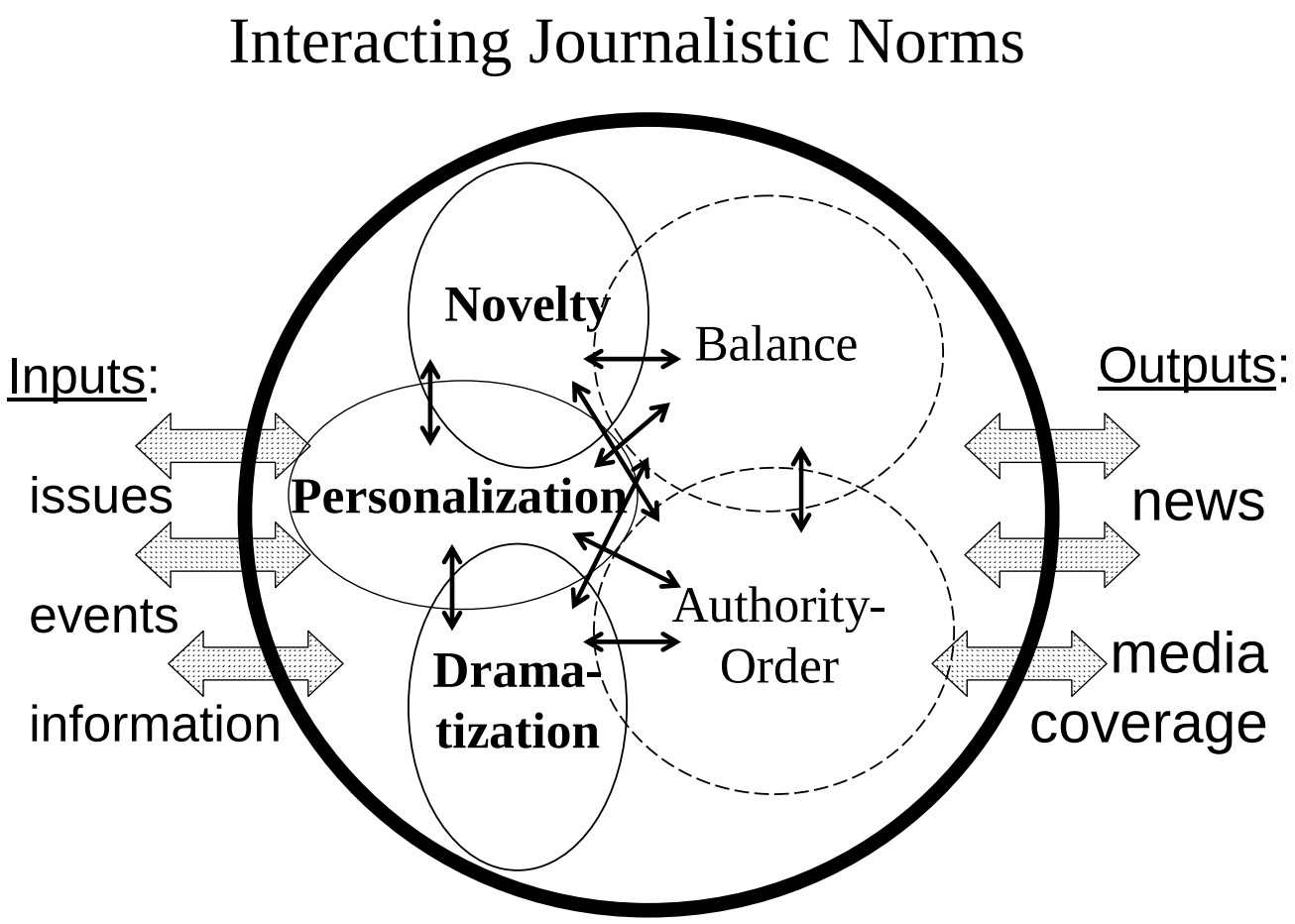
(from Boykoff 2007)

FIGURE 6: Carvalho and Burgess (2005) 'Circuits of Communication'



(from Carvalho and Burgess 2005)

FIGURE 7: Interacting Journalistic Norms



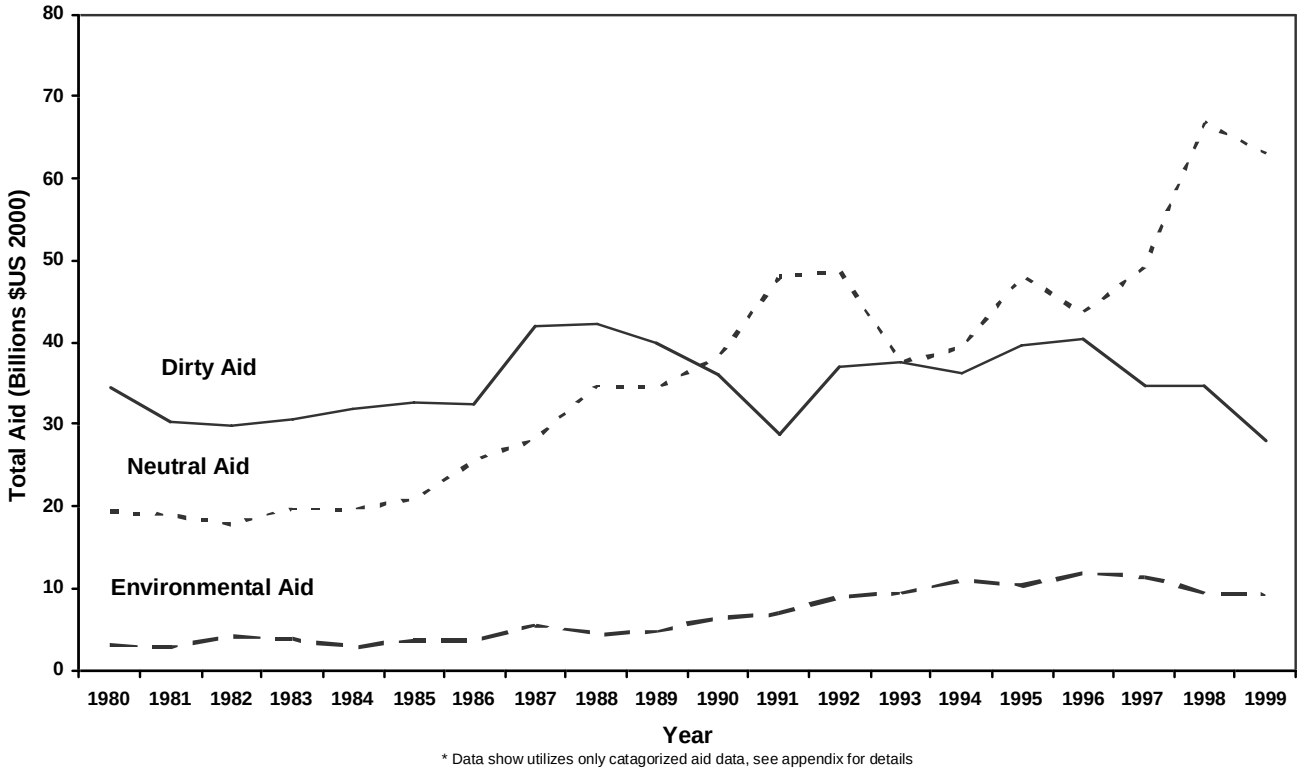
Note: This figure depicts the public arena of mass-media production, where journalistic norms interact. These complex and dynamic factors take place between and within (as well as feed back into) a larger context of political, social, cultural and economic norms and pressures (from Boykoff and Boykoff 2007).

TABLE II: global warming questions from 2006 Nielsen Global Omnibus survey

Country	% stating global warming to be 'biggest concern over the next 6 months' **Total (male/female); age group of greatest concern**		% stating global warming to be 'second biggest concern over the next 6 months' **Total (male/female); age group of greatest concern**		% who have 'heard or read anything about the issue of global warming' **Total (male/female); age group of least informed**		% who stated the causes of global warming to be 'natural changes' (not anthropogenic) **Total (male/female); age group of highest % reporting**	
Australia	13 (10/17)	60-64	11 (10/11)	65+	93 (93/93)	< 20, 21-29	8 (8/7)	40-44, 45-49, 50-54
Canada	7 (8/7)	21-24	6 (7/6)	60-64	89 (92/85)	40-44	7 (7/7)	65+
China	1 (1/1)	55-59	1 (1/1)	65+	98 (99/97)	< 20	2 (2/2)	50-54
Czech Republic	1 (1/0)	25-29	1 (0/2)	50-54	99 (100/98)	21-24	7 (6/9)	55-59
Hong Kong	3 (5/1)	< 20	3 (2/5)	< 20	92 (95/90)	50-54, 65+	2 (2/3)	50-54, 55-59
Ireland	4 (5/3)	65+	5 (6/4)	55-59	94 (96/90)	21-24	4 (3/4)	55-59
Japan	3 (2/4)	< 20	5 (5/6)	60-64	85 (86/85)	< 20	5 (4/5)	25-29
Korea	1 (0/1)	21-24, 25-29	1 (1/2)	40-44	96 (97/95)	40-44	4 (5/2)	25-29, 50-54
Malaysia	4 (4/4)	35-39	5 (4/5)	21-24, 50-54	75 (82/66)	< 20	4 (5/2)	50-54
Netherlands	3 (3/3)	21-24, 35-39, 60-64	6 (7/5)	50-54	93 (95/90)	35-39	10 (9/11)	55-59
New Zealand	5 (3/6)	65+	7 (7/6)	21-24, 50-54	94 (97/91)	21-24	12 (13/10)	60-64
Russia	1 (1/1)	50-54	no data	no data	98 (98/97)	21-24	10 (14/7)	60-64
Singapore	4 (3/5)	< 20	3 (3/3)	55-59	84 (86/81)	50-54	4 (2/5)	40-44
South Africa	1 (1/1)	< 20	2 (2/3)	55-59	91 (94/86)	25-29	4 (5/3)	65+
Thailand	6 (5/7)	55-59	6 (4/7)	45-49	98 (97/98)	55-59	1 (1/1)	21-24, 35-39, 40-44
United Kingdom	7 (8/5)	< 20	7 (7/7)	< 20	92 (94/89)	25-29	8 (9/7)	55-59
United States	2 (1/2)	25-29, 35-39	4 (4/4)	65+	83 (86/81)	40-44	12 (16/9)	45-49, 65+
Brazil	3 (3/2)	< 20	4 (4/3)	35-39	97 (99/94)	55-59	3 (3/4)	55-59
France	12 (14/9)	61-64	15 (15/14)	45-49	97 (97/97)	21-24, 25-29, 30-34	5 (5/5)	40-44
Germany	3 (3/2)	60-64	4 (4/4)	< 20	94 (96/90)	21-24	7 (7/7)	65+
India	3 (3/5)	65+	5 (5/3)	< 20	90 (90/92)	21-24	6 (6/8)	55-59
Indonesia	3 (4/2)	50-54	3 (3/4)	< 20	89 (94/79)	21-24	3 (3/1)	45-49
Mexico	2 (2/2)	55-59	3 (1/4)	60-64	96 (98/94)	65+	3 (3/3)	60-64
United Arab Emirates	3 (2/3)	55-59	2 (2/2)	40-44	77 (73/81)	30-34	8 (8/7)	40-44

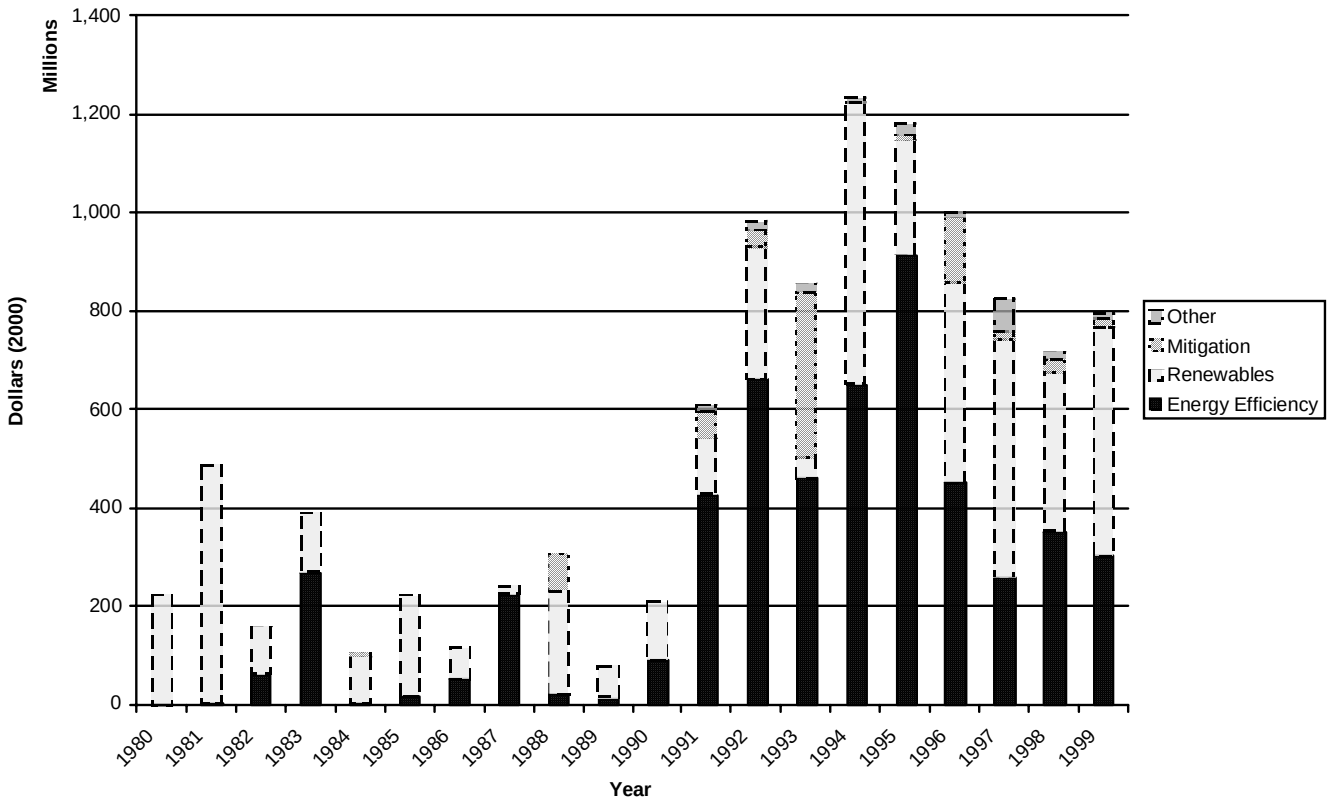
NOTE: The first group of countries coincides with the aforementioned discussions of media coverage of climate change and adaptation (in TABLE I) (except for Israel). Other countries listed below are key players in ongoing UN climate negotiations.

FIGURE 8: Total Aid, 1980-1999



From: Hicks, R., Parks, B., Roberts, T. and Tierney, M. 2007. *Greening Aid: Understanding Environmental Foreign Assistance to Developing Countries*. Oxford: Oxford University Press. Forthcoming.

FIGURE 9: Annual Climate Aid By Sector



From: Hicks, R., Parks, B., Roberts, T. and Tierney, M. 2007. *Greening Aid: Understanding Environmental Foreign Assistance to Developing Countries*. Oxford: Oxford University Press. Forthcoming.

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