

Contents

Running Head: STRATEGIC AGENTS OF COMMUNICATION



**Strategic Agents of Communication:
Communication Artefacts of the Global Carbon Project
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Communication Analysis of the Global Carbon Project

Lisa Couper

Australian National University

Contents

Acknowledgements	4
Introduction	6
Literature Review	9
Model	11
Method	14
Subject	17
Results	21
1. UNESCO – Scope Brochure	24
Artefact	24
Science	26
Opportunity	26
Resources	27
Agents	28
2. ESSP Conference Pack Brochure	35
Artefact	35
Science	37
Opportunity	37
Resources	37
Agents	37
3. ESSP Conference Poster	40
Artefact	40
Science	42
Resources	42
Agents	43
4. Emissions Growth - Media Release	46
Artefact	46
Science	48
Opportunity	48
Resources	49
Agents	49
5. <i>Science</i> Publication – Media Release	52
Artefact	52
Science	54
Opportunity	54
Resources	54
Agents	55
6. <i>PNAS</i> Publication May 2007– Media Release	61
Artefact	61
Science	63
Opportunity	63
Resources	64
Agents	64

7. Global Carbon Project web site redesign	71
Artefact	71
Science	74
Opportunity	74
Resources	75
Agents	76
8. <i>Carbon Reductions and Offsets</i> Report	81
Artefact	81
Science	85
Opportunity	85
Resources	86
Agents	86
9. Carbon Offset Workshop Presentation – Barcelona	89
Artefact	89
Science	91
Opportunity	91
Resources	92
Agents	92
10. <i>PNAS</i> Publication October 2007 – Media Release	95
Artefact	95
Science	97
Opportunity	97
Resources	97
Agents	98
Discussion	105
Conclusion	109
References	111
Figures	113
Tables	114

Acknowledgements

While this case study focuses on my efforts as a science communicator it is important to make clear that the greatest share of communications originating from the Canberra office of the Global Carbon Project was undertaken by Dr. Pep Canadell, executive director of the Global Carbon Project and Dr Michael Raupach, co-chair of the Scientific Steering Committee. During the time in question they travelled extensively, giving presentations and attending policy, research and scientific meetings as well as authoring significant peer reviewed papers. They gave many interviews for press, radio and television and were dedicated to making sure that important findings in carbon science were published in the journals that would give the greatest authority and reach. Their encouragement and support for my efforts were invaluable. Staff at the Centre for the Public Awareness of Science at Australian National University were flexible in support of the work I did with the Global Carbon Project and in the preparation of this sub-thesis, especially through the comments and review of Dr. Cathy Frazer and Dr. Rod Lamberts and the encouragement of Professor Chris Bryant to develop the concept of agents of communication.

Table 1. Acronyms

Acronym	Meaning
AGO	Australian Greenhouse Office (now DCC see below)
AusSMC	Australian Science Media Centre
COP12	Twelfth Session of the Conference of the Parties to the UN Framework Convention on Climate Change
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DCC	Department of Climate Change (Australia)
DIVERSITAS	International Programme of Biodiversity Science
ESSP	Earth System Science Partnership
GCP	Global Carbon Project
GCTE	Global Change Terrestrial Ecosystem
GEC	Global Environmental Change
IGBP	International Geosphere-Biosphere Programme
IHDP	International Human Dimensions Programme on Global Environmental Change
IPCC	Intergovernmental Panel on Climate Change
NIES	National Institute for Environmental Studies (Japan)
Scope	Scientific Committee on Problems of the Environment
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
URCM	Urban and Regional Carbon Management
WCRP	World Climate Research Programme
WMO	World Meteorological Organisation

Introduction

As an international project of the Earth System Science Partnership (ESSP) the Global Carbon Project (GCP) produces synthesis science research addressing the human-carbon-climate system. Fundamentally focused on communication between scientists, the GCP has reached a much greater audience through active and strategic efforts to publicise their results. The lessons from this small organisation can inform the communication practices of scientists wishing to reach a broader audience with few resources.

Around the world, the onset of climate change has become accepted as a reality by a growing number of individuals, communities, businesses and governments. Currently, most impacts of this global environmental process are very difficult to pinpoint without complex measurements, remote sensing equipment and advanced analytical computer power. This unique situation keeps the source of information about the nature and likely progression of the global climate shift and its implications for life on earth, in the hands of the scientific community.

For example, carbon dioxide (CO₂), the most common atmospheric greenhouse gas (gas contributing to increased heat retention near the planet's surface), is colourless, odourless and undetectable without specialised equipment. The concentration of CO₂ in the atmosphere has increased in just over 200 years from 280 parts per million (ppm) in pre-industrial times to 380 ppm in 2006 (IPCC, 2007). While that is an increase of over one third and is a level most likely not seen on earth since the first hominids walked the planet some 20 million years ago, these are such minute quantities that we have only been able to measure them continuously for the past fifty years. Less abundant, but more powerful greenhouse gases such as methane, measured in parts per billion, are even more challenging to conceptualise as the trigger for global warming, sea level rise, increased storm severity and species extinction.

With an ever increasing likelihood of there being some abrupt climate shifts over the next century (IPCC, 2007) and the need to plan now for a newly uncertain future, society is dependent on access to new scientific findings with an urgency never felt before. The ability of the global scientific community to develop and implement truly effective communication strategies will determine the extent that rapid adaptation can be informed with the best information. These new global communication strategies will play an important part in our successful transformation in an unpredictable world.

Strategic communication meets specific aims and goals within communities and across nominal boundaries between communities. Internationally there are many actors involved in communicating scientific research needs, data, and findings to increase our understanding of global environmental change (GEC). (See Table 1 for a list of acronyms used in this document). The United Nations in particular has supported robust scientific inquiry and communication into climate change through their UN Framework Convention on Climate Change (UNFCCC) secretariat which formed the Intergovernmental Panel on Climate Change (IPCC), administered by two of their member organisations, the World Meteorological Organisation (WMO) and United Nations Environment Programme (UNEP). Because the IPCC does not carry out research itself, instead publishing synthesis reports based on peer reviewed published scientific literature, effective communication strategies are a core requirement for the organisations' success.

A defining aspect of GEC research is the cross disciplinary nature of core processes including biogeochemistry, weather and climate systems, human interactions and ecosystem synergies. This poses special problems in developing communication strategies which must bridge policy and public boundaries as well as scientific fields, in order to develop and implement new global environmental management practices. This study seeks an understanding of the communication processes that facilitate the incorporation of global environmental change science into available knowledge. In light of the current increase in both the magnitude and speed of global environmental change (UNEP, 2007) I identified increased dissemination and acceptance of the most recent research findings as a significant communication process for inquiry.

The Global Carbon Project have achieved a degree of international recognition for their work without a formalized communication strategy or budget. The identification and understanding of the implicit underlying communication strategy of the GCP was the primary goal of the study. It seemed initially that they operated through using opportunities as they arose, by focusing limited resources on projects with the most potential to reach their highest priority audiences: carbon scientists and environmental policy makers. It was not clear what factors led to success or where failures would be found.

The core issue chosen for this study can be summed up thus;

What artefacts of communication strategies increase dissemination and acceptance of global environmental change science findings and what are the agents which drive this increase?

Literature Review

In the most developed nations, media and press networks have become a primary avenue for the dissemination of science (Hayes & Grossman, 2006). The current push for scientific answers to policy questions has aided the press in becoming both the producer and consumer of research communication (Henderson-Sellers, 1998) as well as an important conduit for science information to policy makers (Tiessen & et al, 2007). The information flow through mass media has undergone a fundamental transformation as global telecommunication technology has developed.

The advent of electronic media and the development of internet based news services have provided the audience with tools to gather, access, and use the news to serve individual and community needs. With the advent of the audience as an active and engaged participant the receivers in turn act to disseminate the information, informing their own social constructs (Bender, Chesnais, Elo, Shaw, & Shaw, 1996). The degree of this public engagement with a problem may determine the success of direct dissemination of scientific information to the public when limited to a unidirectional flow of information (Kim, 2007).

The spread of GEC findings from peer reviewed science journals through media releases and media networks, to web logs or 'blogs' in the broader community can be characterised through the news flow according to the agents which disseminate the information (Antilla, 2005) where the original artefact is communicated by a number of intermediaries through diverse mechanisms including press releases, media alerts, network hosting, press reporting, special interest reporting and social networks including blogs (Moores, 2000). While this builds on White's early gatekeeper model of communication and McNelly's model of intermediate communicators in news flows (Windahl, 1981) the emphasis is not on the gatekeepers who can deny access and impede the flow of information. Instead the agents of dissemination model is focused on the processes and opportunities which carry and advance the spread of the message.

Where findings and their implications were spread through traditional media outlets, the selection of science news for publication involved editorial decisions which can be quite subjective and vague, based largely on the bias of the particular media organization (Stocklmayer, Gore, & Bryant, 2001). While there have been historical and practical barriers between journalists and scientists in getting research findings to the public (Donghong, Metcalf, & Schiele, 2006), the world wide web and increasing awareness of changes in climate and the global environment have recently fostered a high level of engagement in the media process (Gough & Shackley, 2001).

Scientists themselves are increasingly becoming informed about science through mass media. A study into the citation patterns of papers published by peer reviewed journals including *Nature* and *Science* which were covered by newspapers and television broadcast (Kiernan, 2003) found that the popularised findings were more highly cited. This highlighted the questions of how influential both press releases from science journals are in journalists choice of subject as well as the influence of the ensuing coverage on scientists perceptions of published findings. Increased web use supports new developments in public participation techniques which allow global interconnection of web sites and hyperlinks to media stories (Rogers & Marres, 2000).

The degree of engagement with the issues of global environmental change influence both the media types and breadth of dissemination initiated to pass new information along. This is strongest when it reinforces a personal world view and ideology (Carvalho, 2007). Public understanding of environmental change science has been demonstrated to be strongly influenced by both mass media and interpersonal communication, especially in the connection between fossil fuel use and climate change (Stamm, Clark, & Eblacas, 2000). A study into some of the gaps in the media dissemination of climate change information noted that fully engaged environmental and science reporter would most consistently use scientists as sources for their information, seeking the most credible sources to convey accurate messages (Wilson, 2000). In the unfettered realm of the internet there are inherent risks to credibility and legitimacy in the free flow of global environmental change science through the diverse scientific, political and media agents (Weingart, Engels, & Pansegrau, 2000) that widen the dissemination of research findings.

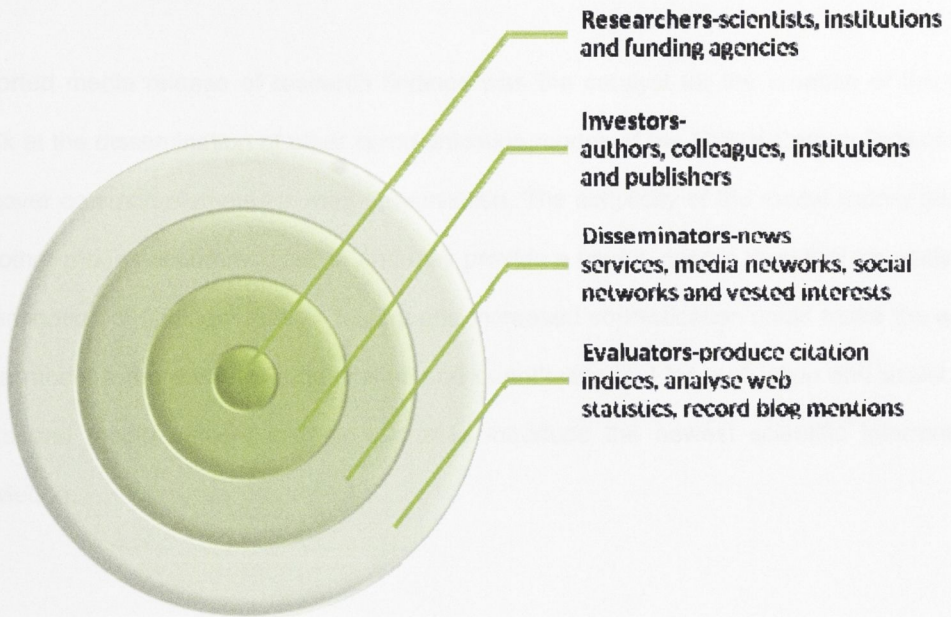
Model

I visualized the information from researchers flowing to a distant audience through agents of communication while observing media coverage of the peer reviewed paper released in the journal *Science*, cited as artefact 5 of this study. Five different institutions issued press releases and the use of certain headlines and images made it possible to connect media releases with certain stories. In advance of the publication my focus was on the requirements of the researchers, authors and the journal. Because I was involved in providing a freely accessible web based information portal for background information, supporting images and relevant quotes, during and after an embargo period, I was aware of the spread of the messages after publication as they were sent out and picked up by others. This is where the multidimensional flow of unregulated electronic information through the internet carried the messages with a surprising speed and breadth. In order to report on the effectiveness of these communication efforts, I categorised articles and mentions of the paper's findings according to how far they had spread from the source of the *Science* paper. This was later developed into the agents of communication model.

Initially there are the **researchers**; their institutions and funding agencies. These are the agents who produce the data, analyses, conclusions and syntheses and thereby contribute to our knowledge base. Secondly there are **investors**; the authors, colleagues, institutions and publishers. They invest, not only in the science, but in the communication artefact. They make this additional information known to a larger audience, afford it a mark of authenticity and create a public record of both the science and the findings. They may invest influence instead of finance, seeking reward in prestige or public awareness. Thirdly the **disseminators** take up the artefact and the information it contains, now in the public arena, through news services, media networks, social networks and vested interests. With varied aims and less regulated treatment, these actors bring the information into public awareness and common knowledge. Finally, the **evaluators** are the trackers who monitor some effects these artefacts have on further communication. Aside from the citation index of peer reviewed journals which may take years to show impact, there are a

number of measures that can indicate the spread of specific artefacts including WebTrends, Media Monitors, Google Alerts and the Technorati records of blog mentions.

Figure 1. Sample dissemination pattern



This conceptual model showing agents of communication centres on the release and dissemination of information from the source. This is in contrast to the more complex computer aided mathematical model of agent-based information diffusion, dFusion (Sinnreich, Chib, & Gilbert, 2008) which maps the extent to which members of societies or social networks have access to information.

While a supported media release of research findings was the catalyst for the creation of the model, I decided to look at the dissemination of other communication modes of the Global Carbon Project to see if this might uncover common elements in their transmission. The simplicity of the model readily allows it to be applied to other modes of communication and may provide a useful, coarse level tool for analysing the effective dissemination of findings. Further testing and increased sophistication could make the agents of communication model a more effective qualitative and quantitative tool for evaluation and assist science communicators and media officers in their efforts to introduce the newest scientific information into common knowledge.

Method

During the 12 month period I acted as a part-time communications officer for the GCP, I observed and contributed to the decision making process and was involved in preparing a range of communication artefacts. This information was developed into a case study where the artefacts were compared in light of the science presented, opportunity chosen, resources needed and agents of dissemination attracted.

I used a case study of selected artefacts from the Global Carbon Project, a non-governmental scientific organisation, to test the agents of communication model. The Global Carbon Project has a mandate to address the relevance of their findings in carbon science to GEC and present this in a policy relevant context. The Global Carbon Project provided an excellent opportunity for study of strategic scientific information dissemination because they have an organisational commitment to publishing scientific findings, have very limited communication budget and release their findings through highly credible channels as a basic dissemination strategy.

The case study method was chosen to investigate GEC communication strategies and information dissemination because it affords the opportunity to both explore the general conditions under which communications are taking place as well as the particular details of individual instances (Tellis, 1997). This essentially qualitative method allows for personal involvement by the researcher and the development of a constructed narrative in communicating the results and their implications (Marx et al., 2007). It is the method best suited to an open exploration of the communication process as practiced by a specific organisation (Stake, 1995). Because the greatest limitation of the case study method is the difficulty of making general conclusions based on a single sample case, these results have been interpreted to reflect the special nature of the subject organisation (MacNealy, 1997).

This case study results from my reflections on a 12 month period of providing communications support to the Global Carbon Project commencing October 2006. I was employed for an average of 22 hours per

week, while a master's student at the Centre for the Public Awareness of Science at the Australian National University. During this period I was involved in specific communication initiatives which resulted in artefacts of the process. These include the traditional physical artefacts of brochures and posters as well as the virtual artefacts of internet press stories and web sites. I present ten of these as focal points to discuss patterns in communications of the Global Carbon Project.

Observing the spread of Global Carbon Project findings from peer reviewed journals, through media releases and media networks, to blogs in the broader community, led me to characterise the news flow from these finding according to the agents which disseminate the information. I propose a simple series of strategic agents of communication, radiating out from the newly released findings. This concept builds on White's early gatekeeper model of communication where one actor determines which messages are transmitted to the broader audience and later, McNelly's model of intermediate communicators in news flows (Windahl, 1981) which described a series of gatekeepers. Instead, the agents of dissemination focuses on the positive actors promoting the message, rather than those who block it.

These agents of communication can be seen as overlapping groups of 1) *researchers*, 2) *investors*, 3) *disseminators* and 4) *evaluators*. *Researchers* are those who have supported and contributed to the research design and data collection and analyses. *Investors* include authors, colleagues, supporting institutions and journals, all with a stake in the promotion of the findings. Upon public exposure, as in peer reviewed publication, *Disseminators* release the information through news services and media networks, by vested interests and social networks (Schneider & Foot, 2004). *Evaluators* include counters who make numerical records of media messages and their access patterns, trackers who follow the pathways of a particular message and assessors who measure the impacts the information has on subsequent works.

This case study examines a number of different communication methods and compares the dissemination of their artefacts to explore how well the 'agents of communication' model of news flow applies to methods not targeted at the news media. The case study describes each artefact, details the communication

opportunity that occasioned its creation, identifies the financial and staffing resources used to produce it and notes which agents have acted to disseminate it.

Where information is hosted on the Global Carbon Project website, the access and download patterns are recorded for specific pages and files by the hosting web server at CSIRO. Analysis of this data is accomplished through a software package. In this case the data was supplied by the CSIRO using the WebTrends package.

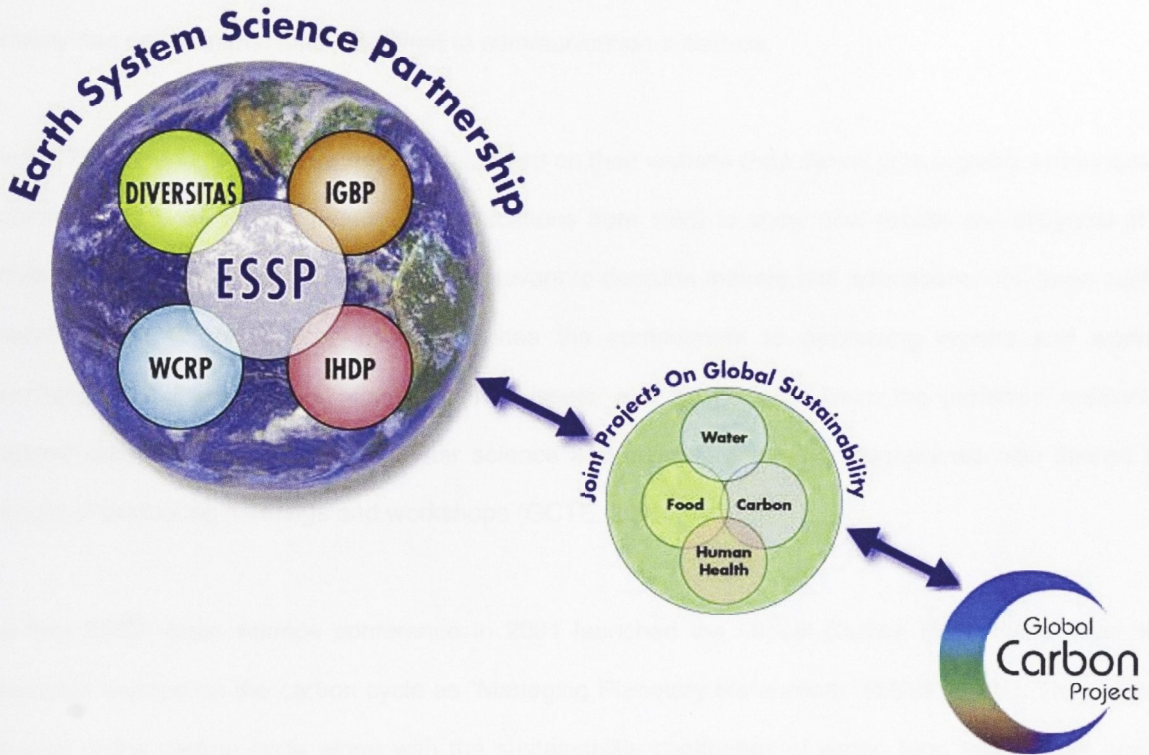
Subject

The Global Carbon Project is a science synthesis arm of the Earth System Science Partnership (ESSP) which promotes the integrated study of changes in the Earth System, and its relationship to global and regional sustainability. The ESSP member organisations include four global change programmes: the International Programme of Biodiversity Science (DIVERSITAS); the International Geosphere-Biosphere Programme (IGBP); the International Human Dimensions Programme on Global Environmental Change (IHDP); and the World Climate Research Programme (WCRP).

The Global Carbon Project, initiated by the Earth System Science Partnership (ESSP), has used publications in peer reviewed journals to further their science communication mandate. The Global Carbon Project was formed to promote a common, mutually agreed knowledge base informing greenhouse gas reduction policy. Much of their high level synthesis research has entered the public arena through the time honoured tradition of the peer reviewed journal and many of the authors are lead and contributing authors to the IPCC reports. Global Carbon Project sponsored analyses has been published in highly respected journals including *Science*, *Nature*, and *The Proceedings of the National Academy of Sciences (PNAS)*. The impacts of these publications have been leveraged through a series of agents, to enter and affect mainstream knowledge.

The ESSP has developed four joint projects to further the GEC research agenda, highlighting direct social relevance (see Figure 1). The Global Carbon Project, formed in 2001, addresses the fundamental issue of GEC interactions in world carbon dynamics and the implications for global sustainability. Communication strategies used in the Global Carbon Project were informed and developed by the Global Change Terrestrial Ecosystem (GCTE), an earlier effort of an ESSP member organisation, IGBP.

Figure 2. Earth System Science Partnership and Global Carbon Project relationship



It is notable that key personnel from the GCTE have been pivotal in developing the Global Carbon Project. The executive director of the Global Carbon Project, Pep Canadell was also Executive Officer of the GCTE and Rowena Foster, previously the GCTE programme officer, has provided support to the Global Carbon Project from its inception. This continuity in personnel has allowed the Global Carbon Project to build on a legacy communication strategy although it has not been articulated as a specific plan and certainly has only minimal funds attached to communication initiatives.

The GCTE Communication Strategy, as displayed on their website (<http://www.gcte.org/about.htm>) makes a commitment to using web based communications from 1998 to show new results and progress of its activities. The policy of making information relevant to decision makers and educational has been carried forward to the Global Carbon Project as has the commitment to publicising reports and working documents. Synthesis papers, special journal issues and books have been the preferred method to establish research findings in the greater science and policy arena. The programmes also shared the strength of promoting meetings and workshops (GCTE, 2000).

The first ESSP open science conference in 2001 launched the Global Carbon Project and presented discussion centred on the carbon cycle as “Managing Planetary Metabolism” (ESSP, 2001). They ranked changes in the carbon cycle along with the sustainability challenges of water, food and human health, forming a joint project to address each of the four topics. This association framed research into the carbon cycle as a human concern equal to our survival basics of food, water and health.

Carbon science was already on the agenda at the conference through parallel sessions and poster presentations. Posters included findings that increased the understanding of the carbon balance of terrestrial ecosystems and ocean basins and displayed results from the integration of climate and carbon cycle models. Carbon flux data and analyses were presented in relation to ecosystems, the human dimension, regions and the globe. One parallel session highlighted the Global Carbon Project, focusing on recent advances in understanding of the global carbon cycle through observations, studies, and modelling

activities. In the sessions on mega cities and biodiversity, carbon footprints and cycles were focal points in global environmental change discussions.

The 2001 ESSP Open Science Conference issued the “Amsterdam Declaration” which called for a new system of global environmental science to evolve from the complementary approaches of GEC research programmes. They called for integrated and collaborative science across the established boundaries of discipline, region and culture. This launch has shaped the identity and mandate of the Global Carbon Project, setting high expectations for the synthesis nature of their research goals and communication initiatives without assigning significant financial resources to their realisation.

Results

Communication is a process and the dissemination of scientific findings can include a wide range of methods, materials and audiences. The intended audience for GEC research has broadened from the small circle of colleagues working in the physical sciences to include researchers in other fields, policy makers, vested interests in industry and society and increasingly, a large range of interested and sometimes influential individuals who are outside of organised groups. In the same way that a painting can be seen as the artefact of an artists process of self expression, I refer in this case study to brochures, media releases, PowerPoint presentations and web pages as artefacts of communication. This affords the opportunity to follow the spread of the artefacts and infer some change in awareness of the message. In this way the artefacts become an icon of the strategic communication process.

These ten artefacts, listed in Table 2, originate from the Global Carbon Project. They have been chosen from materials I myself have prepared and so am privy to the details of their construction and dissemination. In this way they should not be taken as representing either a statistical or random sample of communications issued by the Global Carbon Project during the time in question. They represent a range of communication methods commonly used in a scientific organisation and vary in their size, type of audience, investment and results expected.

In an organisation with few resources and no formal communication strategy these artefacts represent opportunities taken to promote research findings to specific audiences. Artefacts one to four (see table 2 below) were released in connection with large international gatherings, artefacts five, six and ten were media releases timed to coincide with peer reviewed publications. Artefact seven, the report on voluntary carbon offsets, grew from a document prepared for the ESSP then developed to be targeted at a wider audience. The web site redesign, artefact eight, was in part motivated by increased popularity of the Global Carbon Project web site and artefact nine, the workshop presentation, was included to represent the international presentations which are an important communication process for the Global Carbon Project.

Table 7. Communication activities

1. 2006/07 Group Brochure	October 2006
2. Corporate Pack Brochure	November 2006
3. Conference Poster	November 2006
4. Corporate Growth - Media Release	November 2006
5. Website Publication - Media Release	May 2007
6. Press Publication May 2007 - Media Release	May 2007
7. Press Release	June 2007
8. Supply Management and Offset Report	July 2007
9. Supply Offset Workshop Presentation	July 2007
10. Press Publication October 2007 - Media Release	October 2007

Table 2. Communication Artefacts

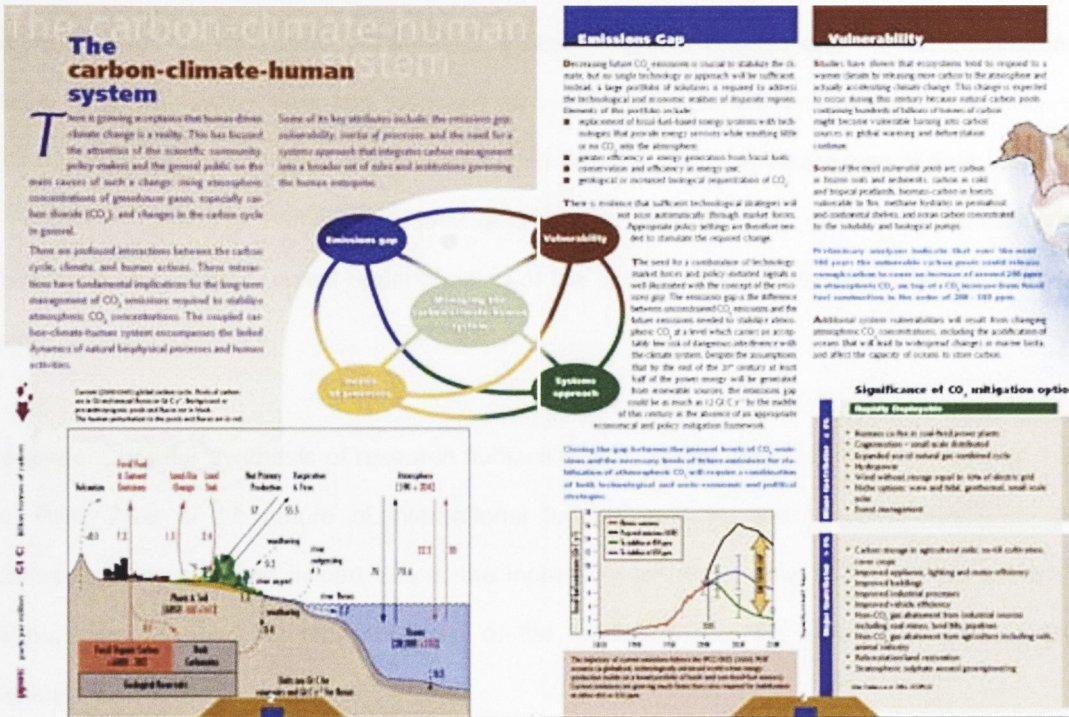
1. UNESCO Scope Brochure	October 2006
2. Conference Pack Brochure	November 2006
3. Conference Poster	November 2006
4. Emissions Growth - Media Release	November 2006
5. <i>Science</i> Publication – Media Release	May 2007
6. <i>PNAS</i> Publication May 2007 – Media Release	May 2007
7. Web Site Redesign	June 2007
8. Carbon Reduction and Offset Report	July 2007
9. Carbon Offset Workshop Presentation	July 2007
10. <i>PNAS</i> Publication October 2007 – Media Release	October 2007

1. UNESCO – Scope Brochure

Artefact

Accessible on disc HERE or online at <http://www.globalcarbonproject.org/misc/policyBrief.htm>. This A4 format tri-fold brochure was printed in full colour on 90 GSM semi gloss paper. It presents information about the carbon cycle focused on the policy relevant issues relating to the carbon-climate-human system (see figure 3). The primary intended audience was policy makers with a highly developed environmental agenda.

Figure 3. UNESCO Scope Policy Brief No. 2. "The Global Carbon Cycle"



Science

As is evident from the name of the Global Carbon Project, its inquiry is focused on carbon; its sinks, sources and cycles as well as its relationship to climate, global change and human interactions. The complexity of these relationships and the need for specialised scientific instruments to appreciate their qualities has kept them fully in the arena of advanced science. Growing awareness of their importance in policy decisions affecting human industrial and social patterns has created a demand for the communication of our most current understanding of the carbon cycle to be succinctly and intellectually accessible to policy makers.

This requires a greater synthesis of research findings than is taking place in traditional science research design. Partly due to the nature of international funding patterns which extend mainly to national boundaries and interests and in part due to the increasing wealth of data that is not integrated across disciplines, there is need for more analysis of the implications of the findings of diverse research programmes.

In an attempt to address this issue regarding carbon-climate-human interactions in 2004, the Global Carbon Project fostered the preparation of a volume titled *The Global Carbon Cycle: Integrating Humans, Climate, and the Natural World*. Published through Island Press, it provides a comprehensive view of the most current understanding at the time, with information framed for both the scientific and high level policy audiences (Field & Raupach, 2004). The overarching themes represented in the first five chapters formed the basis for the UNESCO-Scope Policy Brief (UNESCO-Scope, 2006).

Opportunity

In November of 2006, a United Nations organization; the United Nations Framework Convention on Climate Change (UNFCCC) held the Conference of the Parties (COP) in Nairobi. Eight months prior to that event the Global Carbon Project were approached to prepare a policy briefing brochure as the second

in a series published through the Scientific Committee on Problems of the Environment (Scope), who had issued *The Global Carbon Cycle* as *Scope 62* in their science synthesis series. This was to be done under the auspices of the United Nations Education, Scientific and Cultural Organisation (UNESCO) and to be ready in time to be available to the policy makers attending the COP in Nairobi.

Based largely on the work published in *The Global Carbon Cycle* (Field & Raupach, 2004) but with the most recent figures and data, the brochure presented an important opportunity in a number of ways. The association with Scope and UNESCO provided not only printing and layout and graphic support but a valuable distribution system.

By being part of a series of policy brochures there was the added value of a larger profile following from the previous issue, which focused on tools for sustainable development. A major ESSP conference was also planned for November in Beijing and the brochure would be included in the information pack for 1000 participants of this scientific meeting as well.

Resources

The major costs of final editing, layout and graphic design, printing and distribution to the Nairobi COP were covered by Scope and UNESCO. The principal costs for the Global Carbon Project were in creating the content along with printing additional copies for the ESSP Conference and shipping both to the Australian office and later to Beijing.

The content was limited to 1000 words based on a 583 page, densely written book of high level science synthesis. The audience was to be more the policy maker than the scientist but still required detailed scientific information. Content creation fell largely to me as my first major project for the Global Carbon Project and provided my education in both the field of carbon research and writing for policy makers. It required many hours of reading, digesting and drafting under the direction of the Global Carbon Project executive director, Dr Pep Canadell who had a clear vision of what was needed without being proscriptive.

Due to his host of other commitments it was clear that without the support of a science communicator, the Global Carbon Project would not have had the human resources to draft this text.

As the findings of the scientific research were established through publication, this task was largely one of translation. The lexicon of carbon science includes not only specialised vocabulary but reference to specific processes and their disturbances or perturbations. After reading a single sentence I might have a half hour discussion with Dr Canadell in order to understand the depth of meaning and then need to draft a single sentence that summed up the sense of the conversation. The 1000 word limit was in fact the most difficult requirement that we had and required many hours to meet. The initial submission of text for sub-editing in late August, for an October publication, had a word count of approximately 2100.

The other factor that demanded a great deal of time was the needs of the identified audience. We were aware of the importance of distilling the information to concise points but understood our role as well in conveying the scientific evidence that could support decision making. This required careful phrasing and the awareness that we were addressing an international audience from many language bases, well educated for the most part and involved in environmental negotiation. Our intention was also to provide them with supporting evidence which could be forwarded to those who were less educated or experienced in the environmental area so giving them tools to disseminate the information.

Agents

See figure 4 for the Dissemination pattern of the UNESCO Scope Policy Brief No. 2.

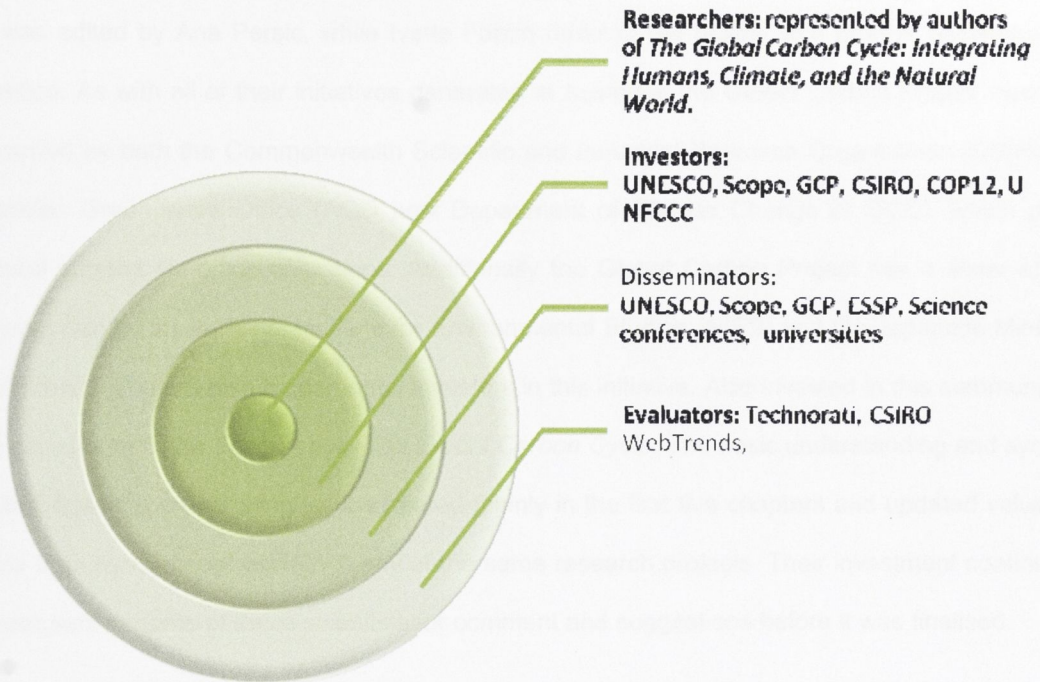
Researchers: represented by authors of The Global Carbon Cycle: Integrating Humans, Climate, and the Natural World.

Investors: UNESCO, Scope, GCP, CSIRO, COP12, UNFCCC

Disseminators: UNESCO, Scope, GCP, ESSP, Science conferences, universities

Evaluators: Technorati, CSIRO WebTrends

Figure 4. Dissemination pattern: UNESCO Scope Policy Brief No. 2.



Researchers in this case represent a cross section of international science projects, institutions and academics, cutting across disciplines and national boundaries.

Investors in the production of this policy brief were firstly UNESCO and Scope, who initiated the policy brief series and invited the Global Carbon Project to contribute. Through the Scope office in Paris, the final product was edited by Ana Persic, while Ivette Fabbri directed the design with graphic assistance from Zineb Hadjou. As with all of their initiatives generated in Australia, the Global Carbon Project investment was supported by both the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Australian Greenhouse Office (AGO now Department of Climate Change or DCC), which provide fundamental support for office operations. Additionally the Global Carbon Project has a sister office in Japan, supported by the National Institute for Environmental Studies (NIES) and the Japanese Ministry of the Environment, who are also fundamental investors in this initiative. Also invested in this communication were the co-authors of the Scope book, *The Global Carbon Cycle*. The basic understanding and synthesis was distilled from the overarching issues treated mainly in the first five chapters and updated values and data came from more recent work by many of the same research projects. Their investment continued as the text was sent to some of these scientists for comment and suggestions before it was finalised.

Disseminators for the brochure initially targeted the UNFCCC Conference of the Parties at its twelfth session, held at Nairobi from November 6-17, 2006. Copies were also included in almost 1000 participant's packages for the ESSP open science conference, Global Environmental Change: Regional Challenges, held November 9-12, 2006 in Beijing.

But this was only the beginning of the distribution of the information. An electronic version of the brochure had been posted to the Global Carbon Project website and during the conference journalists were directed to the brochure as a source of background information for a press release. In this way the Global Carbon Project web site, the conference press release and the journalists acted to disperse the information in the brochure to a wider public. Early in 2007 the Global Carbon Project issued an electronic newsletter which

went to their complete mailing database of almost 2000 addresses, followed up two months later with a mail out to the same people. The United Nations Environment Programme (UNEP) gained permission to publish one of the graphs from the brochure in Global Environment Outlook 4 (GEO-4): Environment for Development, published in September 2007 and many other uses have been made of the content without consultation. Links to the Global Carbon Project download page have been set up by other ESSP organisations as well as UNESCO, Scope and interested research organisations including the U.S. National Oceanic and Atmospheric Administration (NOAA).

100	Global Carbon Project Overview	100
101	Global Carbon Project Mission	101
102	Global Carbon Project Objectives	102
103	Global Carbon Project Structure	103
104	Global Carbon Project Partners	104
105	Global Carbon Project Funding	105
106	Global Carbon Project Publications	106
107	Global Carbon Project Outreach	107
108	Global Carbon Project Contact	108
109	Global Carbon Project Glossary	109
110	Global Carbon Project Appendix	110
111	Global Carbon Project Bibliography	111
112	Global Carbon Project Index	112
113	Global Carbon Project Acknowledgements	113
114	Global Carbon Project Disclaimer	114
115	Global Carbon Project Copyright	115
116	Global Carbon Project Privacy Policy	116
117	Global Carbon Project Terms and Conditions	117
118	Global Carbon Project Site Map	118
119	Global Carbon Project Feedback	119
120	Global Carbon Project Contact Us	120
121	Global Carbon Project Sitemap	121
122	Global Carbon Project RSS Feeds	122
123	Global Carbon Project Social Media	123
124	Global Carbon Project Newsletters	124
125	Global Carbon Project Press Releases	125
126	Global Carbon Project Media Kit	126
127	Global Carbon Project Press Photos	127
128	Global Carbon Project Press Videos	128
129	Global Carbon Project Press Interviews	129
130	Global Carbon Project Press Conferences	130
131	Global Carbon Project Press Events	131
132	Global Carbon Project Press Releases Archive	132
133	Global Carbon Project Press Photos Archive	133
134	Global Carbon Project Press Videos Archive	134
135	Global Carbon Project Press Interviews Archive	135
136	Global Carbon Project Press Conferences Archive	136
137	Global Carbon Project Press Events Archive	137
138	Global Carbon Project Press Releases Search	138
139	Global Carbon Project Press Photos Search	139
140	Global Carbon Project Press Videos Search	140
141	Global Carbon Project Press Interviews Search	141
142	Global Carbon Project Press Conferences Search	142
143	Global Carbon Project Press Events Search	143
144	Global Carbon Project Press Releases RSS	144
145	Global Carbon Project Press Photos RSS	145
146	Global Carbon Project Press Videos RSS	146
147	Global Carbon Project Press Interviews RSS	147
148	Global Carbon Project Press Conferences RSS	148
149	Global Carbon Project Press Events RSS	149
150	Global Carbon Project Press Releases Social	150
151	Global Carbon Project Press Photos Social	151
152	Global Carbon Project Press Videos Social	152
153	Global Carbon Project Press Interviews Social	153
154	Global Carbon Project Press Conferences Social	154
155	Global Carbon Project Press Events Social	155
156	Global Carbon Project Press Releases Email	156
157	Global Carbon Project Press Photos Email	157
158	Global Carbon Project Press Videos Email	158
159	Global Carbon Project Press Interviews Email	159
160	Global Carbon Project Press Conferences Email	160
161	Global Carbon Project Press Events Email	161
162	Global Carbon Project Press Releases Print	162
163	Global Carbon Project Press Photos Print	163
164	Global Carbon Project Press Videos Print	164
165	Global Carbon Project Press Interviews Print	165
166	Global Carbon Project Press Conferences Print	166
167	Global Carbon Project Press Events Print	167
168	Global Carbon Project Press Releases PDF	168
169	Global Carbon Project Press Photos PDF	169
170	Global Carbon Project Press Videos PDF	170
171	Global Carbon Project Press Interviews PDF	171
172	Global Carbon Project Press Conferences PDF	172
173	Global Carbon Project Press Events PDF	173
174	Global Carbon Project Press Releases Audio	174
175	Global Carbon Project Press Photos Audio	175
176	Global Carbon Project Press Videos Audio	176
177	Global Carbon Project Press Interviews Audio	177
178	Global Carbon Project Press Conferences Audio	178
179	Global Carbon Project Press Events Audio	179
180	Global Carbon Project Press Releases Mobile	180
181	Global Carbon Project Press Photos Mobile	181
182	Global Carbon Project Press Videos Mobile	182
183	Global Carbon Project Press Interviews Mobile	183
184	Global Carbon Project Press Conferences Mobile	184
185	Global Carbon Project Press Events Mobile	185
186	Global Carbon Project Press Releases XML	186
187	Global Carbon Project Press Photos XML	187
188	Global Carbon Project Press Videos XML	188
189	Global Carbon Project Press Interviews XML	189
190	Global Carbon Project Press Conferences XML	190
191	Global Carbon Project Press Events XML	191
192	Global Carbon Project Press Releases JSON	192
193	Global Carbon Project Press Photos JSON	193
194	Global Carbon Project Press Videos JSON	194
195	Global Carbon Project Press Interviews JSON	195
196	Global Carbon Project Press Conferences JSON	196
197	Global Carbon Project Press Events JSON	197
198	Global Carbon Project Press Releases API	198
199	Global Carbon Project Press Photos API	199
200	Global Carbon Project Press Videos API	200
201	Global Carbon Project Press Interviews API	201
202	Global Carbon Project Press Conferences API	202
203	Global Carbon Project Press Events API	203
204	Global Carbon Project Press Releases API Key	204
205	Global Carbon Project Press Photos API Key	205
206	Global Carbon Project Press Videos API Key	206
207	Global Carbon Project Press Interviews API Key	207
208	Global Carbon Project Press Conferences API Key	208
209	Global Carbon Project Press Events API Key	209
210	Global Carbon Project Press Releases API Docs	210
211	Global Carbon Project Press Photos API Docs	211
212	Global Carbon Project Press Videos API Docs	212
213	Global Carbon Project Press Interviews API Docs	213
214	Global Carbon Project Press Conferences API Docs	214
215	Global Carbon Project Press Events API Docs	215
216	Global Carbon Project Press Releases API Examples	216
217	Global Carbon Project Press Photos API Examples	217
218	Global Carbon Project Press Videos API Examples	218
219	Global Carbon Project Press Interviews API Examples	219
220	Global Carbon Project Press Conferences API Examples	220
221	Global Carbon Project Press Events API Examples	221
222	Global Carbon Project Press Releases API Tutorials	222
223	Global Carbon Project Press Photos API Tutorials	223
224	Global Carbon Project Press Videos API Tutorials	224
225	Global Carbon Project Press Interviews API Tutorials	225
226	Global Carbon Project Press Conferences API Tutorials	226
227	Global Carbon Project Press Events API Tutorials	227
228	Global Carbon Project Press Releases API FAQ	228
229	Global Carbon Project Press Photos API FAQ	229
230	Global Carbon Project Press Videos API FAQ	230
231	Global Carbon Project Press Interviews API FAQ	231
232	Global Carbon Project Press Conferences API FAQ	232
233	Global Carbon Project Press Events API FAQ	233
234	Global Carbon Project Press Releases API Support	234
235	Global Carbon Project Press Photos API Support	235
236	Global Carbon Project Press Videos API Support	236
237	Global Carbon Project Press Interviews API Support	237
238	Global Carbon Project Press Conferences API Support	238
239	Global Carbon Project Press Events API Support	239
240	Global Carbon Project Press Releases API Contact	240
241	Global Carbon Project Press Photos API Contact	241
242	Global Carbon Project Press Videos API Contact	242
243	Global Carbon Project Press Interviews API Contact	243
244	Global Carbon Project Press Conferences API Contact	244
245	Global Carbon Project Press Events API Contact	245
246	Global Carbon Project Press Releases API About	246
247	Global Carbon Project Press Photos API About	247
248	Global Carbon Project Press Videos API About	248
249	Global Carbon Project Press Interviews API About	249
250	Global Carbon Project Press Conferences API About	250
251	Global Carbon Project Press Events API About	251
252	Global Carbon Project Press Releases API Privacy	252
253	Global Carbon Project Press Photos API Privacy	253
254	Global Carbon Project Press Videos API Privacy	254
255	Global Carbon Project Press Interviews API Privacy	255
256	Global Carbon Project Press Conferences API Privacy	256
257	Global Carbon Project Press Events API Privacy	257
258	Global Carbon Project Press Releases API Terms	258
259	Global Carbon Project Press Photos API Terms	259
260	Global Carbon Project Press Videos API Terms	260
261	Global Carbon Project Press Interviews API Terms	261
262	Global Carbon Project Press Conferences API Terms	262
263	Global Carbon Project Press Events API Terms	263
264	Global Carbon Project Press Releases API License	264
265	Global Carbon Project Press Photos API License	265
266	Global Carbon Project Press Videos API License	266
267	Global Carbon Project Press Interviews API License	267
268	Global Carbon Project Press Conferences API License	268
269	Global Carbon Project Press Events API License	269
270	Global Carbon Project Press Releases API Disclaimer	270
271	Global Carbon Project Press Photos API Disclaimer	271
272	Global Carbon Project Press Videos API Disclaimer	272
273	Global Carbon Project Press Interviews API Disclaimer	273
274	Global Carbon Project Press Conferences API Disclaimer	274
275	Global Carbon Project Press Events API Disclaimer	275
276	Global Carbon Project Press Releases API Privacy Policy	276
277	Global Carbon Project Press Photos API Privacy Policy	277
278	Global Carbon Project Press Videos API Privacy Policy	278
279	Global Carbon Project Press Interviews API Privacy Policy	279
280	Global Carbon Project Press Conferences API Privacy Policy	280
281	Global Carbon Project Press Events API Privacy Policy	281
282	Global Carbon Project Press Releases API Terms of Service	282
283	Global Carbon Project Press Photos API Terms of Service	283
284	Global Carbon Project Press Videos API Terms of Service	284
285	Global Carbon Project Press Interviews API Terms of Service	285
286	Global Carbon Project Press Conferences API Terms of Service	286
287	Global Carbon Project Press Events API Terms of Service	287
288	Global Carbon Project Press Releases API Privacy Policy	288
289	Global Carbon Project Press Photos API Privacy Policy	289
290	Global Carbon Project Press Videos API Privacy Policy	290
291	Global Carbon Project Press Interviews API Privacy Policy	291
292	Global Carbon Project Press Conferences API Privacy Policy	292
293	Global Carbon Project Press Events API Privacy Policy	293
294	Global Carbon Project Press Releases API Terms of Service	294
295	Global Carbon Project Press Photos API Terms of Service	295
296	Global Carbon Project Press Videos API Terms of Service	296
297	Global Carbon Project Press Interviews API Terms of Service	297
298	Global Carbon Project Press Conferences API Terms of Service	298
299	Global Carbon Project Press Events API Terms of Service	299
300	Global Carbon Project Press Releases API Privacy Policy	300
301	Global Carbon Project Press Photos API Privacy Policy	301
302	Global Carbon Project Press Videos API Privacy Policy	302
303	Global Carbon Project Press Interviews API Privacy Policy	303
304	Global Carbon Project Press Conferences API Privacy Policy	304
305	Global Carbon Project Press Events API Privacy Policy	305
306	Global Carbon Project Press Releases API Terms of Service	306
307	Global Carbon Project Press Photos API Terms of Service	307
308	Global Carbon Project Press Videos API Terms of Service	308
309	Global Carbon Project Press Interviews API Terms of Service	309
310	Global Carbon Project Press Conferences API Terms of Service	310
311	Global Carbon Project Press Events API Terms of Service	311
312	Global Carbon Project Press Releases API Privacy Policy	312
313	Global Carbon Project Press Photos API Privacy Policy	313
314	Global Carbon Project Press Videos API Privacy Policy	314
315	Global Carbon Project Press Interviews API Privacy Policy	315
316	Global Carbon Project Press Conferences API Privacy Policy	316
317	Global Carbon Project Press Events API Privacy Policy	317
318	Global Carbon Project Press Releases API Terms of Service	318
319	Global Carbon Project Press Photos API Terms of Service	319
320	Global Carbon Project Press Videos API Terms of Service	320
321	Global Carbon Project Press Interviews API Terms of Service	321
322	Global Carbon Project Press Conferences API Terms of Service	322
323	Global Carbon Project Press Events API Terms of Service	323
324	Global Carbon Project Press Releases API Privacy Policy	324
325	Global Carbon Project Press Photos API Privacy Policy	325
326	Global Carbon Project Press Videos API Privacy Policy	326
327	Global Carbon Project Press Interviews API Privacy Policy	327
328	Global Carbon Project Press Conferences API Privacy Policy	328
329	Global Carbon Project Press Events API Privacy Policy	329
330	Global Carbon Project Press Releases API Terms of Service	330
331	Global Carbon Project Press Photos API Terms of Service	331
332	Global Carbon Project Press Videos API Terms of Service	332
333	Global Carbon Project Press Interviews API Terms of Service	333
334	Global Carbon Project Press Conferences API Terms of Service	334
335	Global Carbon Project Press Events API Terms of Service	335
336	Global Carbon Project Press Releases API Privacy Policy	336
337	Global Carbon Project Press Photos API Privacy Policy	337
338	Global Carbon Project Press Videos API Privacy Policy	338
339	Global Carbon Project Press Interviews API Privacy Policy	339
340	Global Carbon Project Press Conferences API Privacy Policy	340
341	Global Carbon Project Press Events API Privacy Policy	341
342	Global Carbon Project Press Releases API Terms of Service	342
343	Global Carbon Project Press Photos API Terms of Service	343
344	Global Carbon Project Press Videos API Terms of Service	344
345	Global Carbon Project Press Interviews API Terms of Service	345
346	Global Carbon Project Press Conferences API Terms of Service	346
347	Global Carbon Project Press Events API Terms of Service	347
348	Global Carbon Project Press Releases API Privacy Policy	348
349	Global Carbon Project Press Photos API Privacy Policy	349
350	Global Carbon Project Press Videos API Privacy Policy	350
351	Global Carbon Project Press Interviews API Privacy Policy	351
352	Global Carbon Project Press Conferences API Privacy Policy	352
353	Global Carbon Project Press Events API Privacy Policy	353
354	Global Carbon Project Press Releases API Terms of Service	354
355	Global Carbon Project Press Photos API Terms of Service	355
356	Global Carbon Project Press Videos API Terms of Service	356
357	Global Carbon Project Press Interviews API Terms of Service	357
358	Global Carbon Project Press Conferences API Terms of Service	358
359	Global Carbon Project Press Events API Terms of Service	359
360	Global Carbon Project Press Releases API Privacy Policy	360
361	Global Carbon Project Press Photos API Privacy Policy	361
362	Global Carbon Project Press Videos API Privacy Policy	362
363	Global Carbon Project Press Interviews API Privacy Policy	363
364	Global Carbon Project Press Conferences API Privacy Policy	364
365	Global Carbon Project Press Events API Privacy Policy	365
366	Global Carbon Project Press Releases API Terms of Service	366
367	Global Carbon Project Press Photos API Terms of Service	367
368	Global Carbon Project Press Videos API Terms of Service	368
369	Global Carbon Project Press Interviews API Terms of Service	369
370	Global Carbon Project Press Conferences API Terms of Service	370
371	Global Carbon Project Press Events API Terms of Service	371
372	Global Carbon Project Press Releases API Privacy Policy	372
373	Global Carbon Project Press Photos API Privacy Policy	373
374	Global Carbon Project Press Videos API Privacy Policy	374
375	Global Carbon Project Press Interviews API Privacy Policy	375
376	Global Carbon Project Press Conferences API Privacy Policy	376
377	Global Carbon Project Press Events API Privacy Policy	377
378	Global Carbon Project Press Releases API Terms of Service	378
379	Global Carbon Project Press Photos API Terms of Service	379
380	Global Carbon Project Press Videos API Terms of Service	380
381	Global Carbon Project Press Interviews API Terms of Service	381
382	Global Carbon Project Press Conferences API Terms of Service	382
383	Global Carbon Project Press Events API Terms of Service	383
384	Global Carbon Project Press Releases API Privacy Policy	384
385	Global Carbon Project Press Photos API Privacy Policy	385
386	Global Carbon Project Press Videos API Privacy Policy	386
387	Global Carbon Project Press Interviews API Privacy Policy	387
388	Global Carbon Project Press Conferences API Privacy Policy	388
389	Global Carbon Project Press Events API Privacy Policy	389
390	Global Carbon Project Press Releases API Terms of Service	390
391	Global Carbon Project Press Photos API Terms of Service	391
392	Global Carbon Project Press Videos API Terms of Service	392
393	Global Carbon Project Press Interviews API Terms of Service	393
394	Global Carbon Project Press Conferences API Terms of Service	394
395	Global Carbon Project Press Events API Terms of Service	395
396	Global Carbon Project Press Releases API Privacy Policy	396
397	Global Carbon Project Press Photos API Privacy Policy	397
398	Global Carbon Project Press Videos API Privacy Policy	398
399	Global Carbon Project Press Interviews API Privacy Policy	399
400	Global Carbon Project Press Conferences API Privacy Policy	400
401	Global Carbon Project Press Events API Privacy Policy	401
402	Global Carbon Project Press Releases API Terms of Service	402
403	Global Carbon Project Press Photos API Terms of Service	403
404	Global Carbon Project Press Videos API Terms of Service	404
405	Global Carbon Project Press Interviews API Terms of Service	405
406	Global Carbon Project Press Conferences API Terms of Service	406
407	Global Carbon Project Press Events API Terms of Service	407
408	Global Carbon Project Press Releases API Privacy Policy	408
409	Global Carbon Project Press Photos API Privacy Policy	409
410	Global Carbon Project Press Videos API Privacy Policy	410
411	Global Carbon Project Press Interviews API Privacy Policy	411
412	Global Carbon Project Press Conferences API Privacy Policy	412
413	Global Carbon Project Press Events API Privacy Policy	413
414	Global Carbon Project Press Releases API Terms of Service	414
415	Global Carbon Project Press Photos API Terms of Service	415
416		

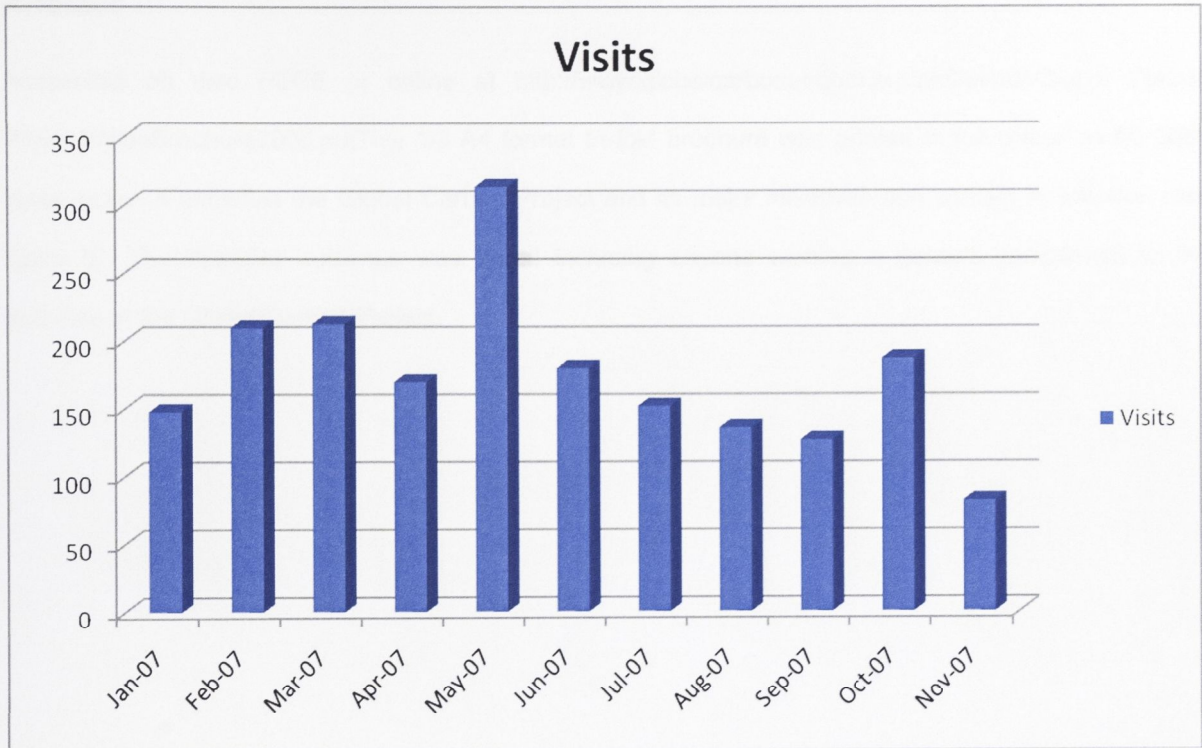
Table 3. Distribution of printed UNESCO Scope Policy Brief No. 2.

QUANTITY	DISTRIBUTION	LOCATION
1000	UNFCCC Conference of the Parties	Nairobi
500	Man and Biosphere conference	Paris
1000	ESSP conference	Beijing
2000	Global Carbon Project Database	International
300	Global Carbon Project affiliate office	Beijing
300	Global Carbon Project office	Tsukba
200	Global Carbon Project office	Canberra
100	Global Carbon Project affiliate office	Washington
100	National Sun Yat-Sen University	Taipei
50	Decarbonising Society workshop	Barcelona
100	Carbon Cycle Symposium	South Africa
100	Carbon in Peatland Symposium	Wageningen
250	Scientific institutions and universities	Australia
6000	Total print run	

Evaluators were not formally engaged in the strategy for this product but there are a number of measurements that can be analysed to signal a level of impact. A distribution list for hard copies of the brochure is shown previously in Table 3, shows that 1000 copies were distributed to targeted audiences at the ESSP conference in Beijing in conference packs and the same amount were distributed at COP12 in Nairobi.

Web statistics have been generated to track downloads for this file from the Global Carbon Project web site and some changes have been made to the both the document and page structures due to internet access requirements. In November 2006 the artefact was posted on the website in two places, with slightly different names, accessible from different pathways. In December 2006 an A4 format version was generated to print correctly for most users and in January 2007 a dedicated page was set up for downloads to make it easier to ascribe activity to this particular product, now accessible only through this page. From November 2006 to November 2007 a total of 4186 downloads have been recorded for the artefact in either form and the dedicated download page was visited 1919 times between January 2007 and November 2007. Figure 5 shows the number of visits to the visits to the download page by month.

Figure 5. Web visits to GCP download page for UNESCO Scope Policy Brief No. 2.



WebTrends visits - Number of visits that include a view of the specified document. Individual visitors are counted each time they come to the Web site, and are counted only once per visit no matter how many pages they look at. If a visitor is idle longer than the idle-time limit, WebTrends assumes the visit was voluntarily terminated. If the visitor continues to browse your site after they reach the idle-time limit, a new visit is counted.

2. ESSP Conference Pack Brochure

Artefact

Accessible on disc HERE or online at [http://www.globalcarbonproject.org/global/pdf/Global Carbon Project-WideBrochure2006.pdf](http://www.globalcarbonproject.org/global/pdf/Global_Carbon_Project-WideBrochure2006.pdf)This 1/3 A4 format tri-fold brochure was printed in full colour on 60 GSM gloss paper. It identifies the Global Carbon Project and its major initiatives and contact information (see figure 6). The intended audience was broad including anyone wishing a general introduction to the activities of the Global Carbon Project.

Figure 6. ESSP Conference Pack Brochure

INTEGRATED FRAMEWORK
INTERNATIONAL PROJECT OFFICES

There are profound interactions between the carbon cycle, climate, and human actions. These interactions have implications for the long-term management of CO₂ emissions required to stabilize atmospheric CO₂ concentrations.

Key attributes of the coupled carbon-climate-human system are: the emissions gap, vulnerability, inertia of processes, and the need for a systems approach that integrates carbon management into a broader set of rules and institutions governing the human enterprise.



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Internationally Coordinated Research
on the
Global Carbon Cycle



www.globalcarbonproject.org

Science

This communication device, with a small amount of very general science content, was designed mainly to introduce the Global Carbon Project; its aims, science themes, activities and the integrated framework behind global carbon research. Contact details were provided for the International Project Offices in Australia and Japan as well as regional offices. Rather than an explanation of carbon science it is a document to point policy makers and other interested parties to the Global Carbon Project as a source of more in-depth analysis.

Opportunity

The ESSP Conference in Beijing was the stimulus for the production of this brochure. Copies of it were included as part of the information package for the conference attendees to give background to the Global Carbon Project and its functions. This was seen as a low cost opportunity to further develop the recognition created through the Policy Brief discussed above.

Resources

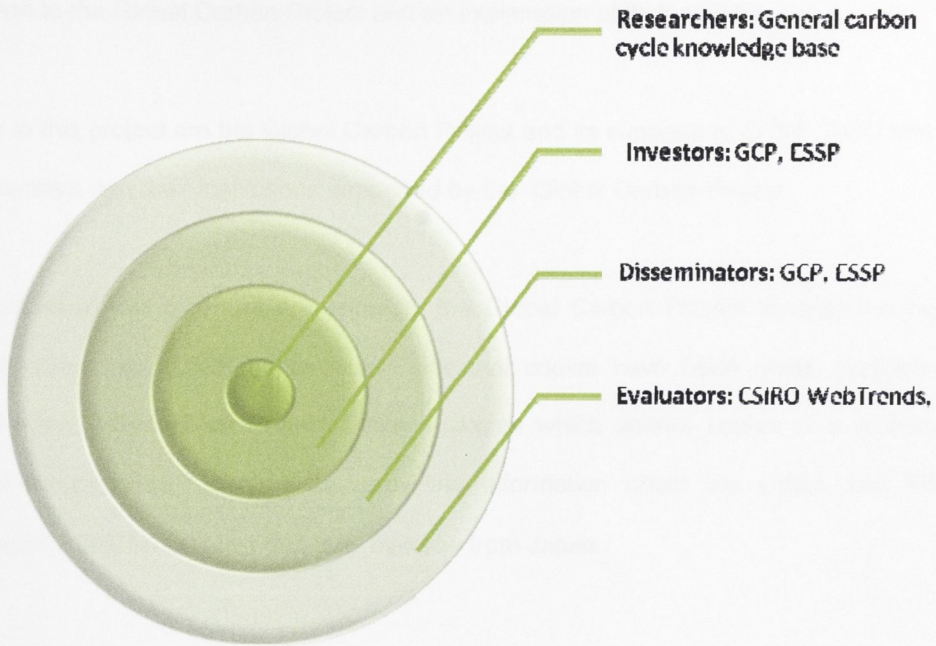
This was not a resource intensive project in part because it was almost entirely created by the science communicator from existing text and images. The time commitment was under 30 hours and the printing and shipping costs were under AUD 1500.

Agents

See figure 7 for the Dissemination pattern of the ESSP Conference Pack Brochure.

- **Researchers:** General carbon cycle knowledge base
- **Investors:** GCP, ESSP
- **Disseminators:** GCP, ESSSP
- **Evaluators:** CSIRO WebTrends,

Figure 7. Dissemination pattern: ESSP Conference Pack Brochure



Researchers played a minor part in this artefact. While this was not a communication product designed to release new and innovative scientific discoveries it does depend on research science for its main content and raison d'être. The majority of the text is information about carbon science research, acting as an introduction to the Global Carbon Project and an explanation of its functions.

Investors in this project are the Global Carbon Project and its supporters, ESSP, AGO and CSIRO as well as the scientists and their institutions supported by the Global Carbon Project.

Disseminators of this brochure are primarily the Global Carbon Project through the organizers of the previously mentioned ESSP conference. Additional copies have been made available to the Global Carbon Project International Project Office in Japan which shared copies of a similar brochure they produced for the ESSP conference, providing information about the Urban and Regional Carbon Management (URCM) initiative that they oversee from Japan.

Evaluators for this artefact are limited to the WebTrends statistics for the Global Carbon project website but, while this artefact has been posted to the Global Carbon Project web site, it has never appeared in the top 95% of downloads from the site. There have been no other evaluators identified in regard to the effect of this brochure and no significant external mention of it has come to our attention. In this regard it has been used in a similar manner to a calling card, casually distributed with little expectation of individual effect.

3. ESSP Conference Poster

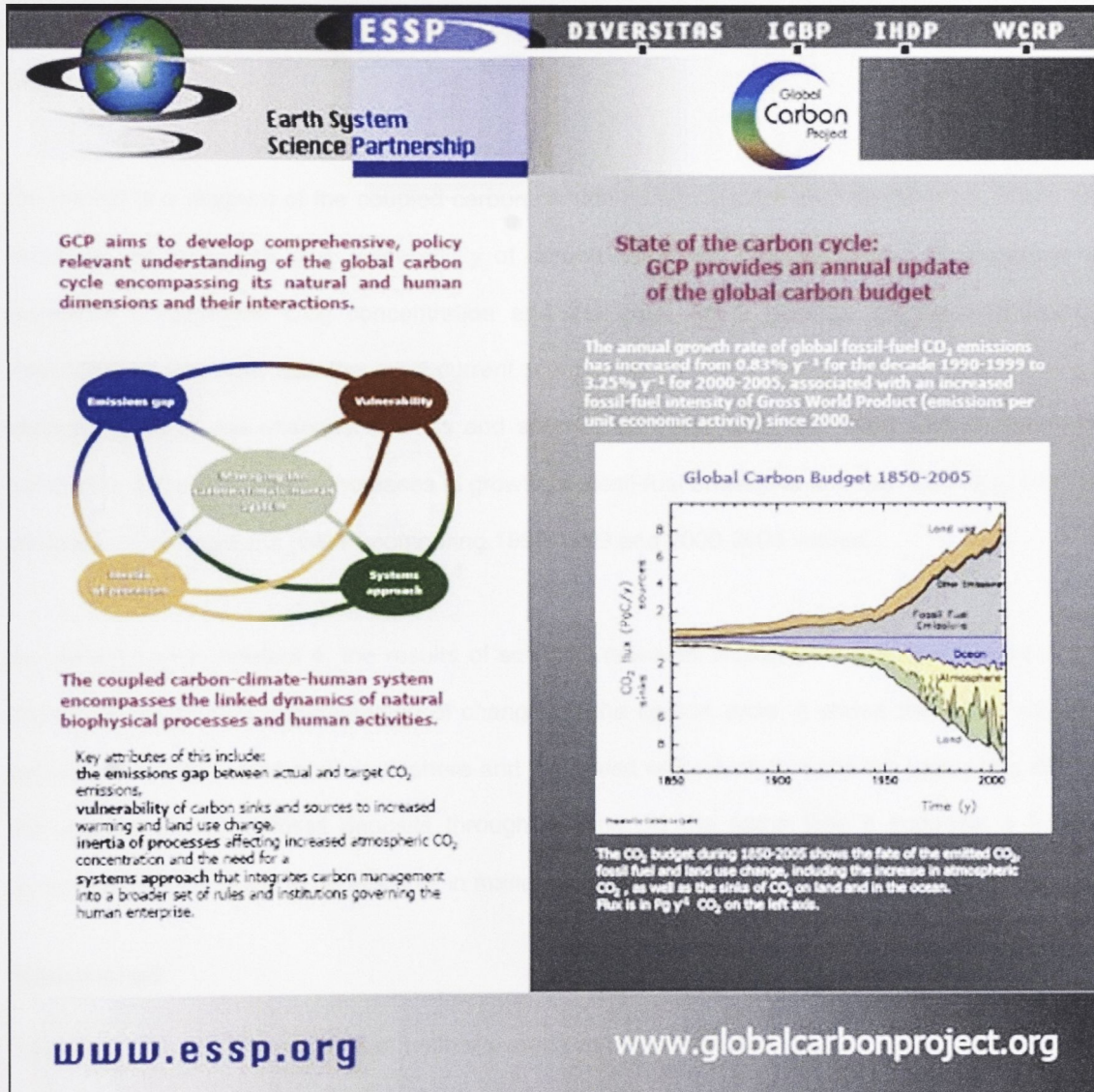
Artefact

Accessible on disc HERE or online at

http://www.globalcarbonproject.org/global/pdf/gcp_esspconf.beijing2006.pdf.

This 1000mm X 1000mm poster was printed in full colour on 90 GSM semi gloss paper. It presents two key concepts in carbon science; the relationship of the coupled carbon-climate-human system and the annual update of the global carbon budget, and identifies the Global Carbon Project and ESSP (see figure 8). The targeted audience was the participants of the ESSP open science conference in Beijing, 2006.

Figure 8. ESSP Conference Poster



Science

This poster displays two important scientific concepts that have strong bearing on policy concerns. The value of the message was increased through providing more recent data than was widely available at the time.

On the left is a diagram of the coupled carbon-climate-human system and identification of key attributes, including the emissions gap, vulnerability of carbon sinks and sources, inertia of processes affecting increased atmospheric CO₂ concentration and the need for a systems approach to management. Presented on the right was the most current representation of the global carbon budget with a graphic representation of the changes in sinks and sources between 1850 and 2005. This is supported by a statement of the percentage increases in growth of fossil-fuel emissions and the rise in fossil-fuel intensity of Gross World Products (GWP) comparing 1990-1999 and 2000-2005 values.

As we will see in Artefact 4, the results of scientific research displayed in this poster have a significant impact on our current understanding of changes in the carbon cycle. It shows the global shift of carbon between the ocean, land and atmosphere and the speed with which humans are increasing this load from the release of stored fossil deposits through burning. At the same time it suggests a framework of considerations for policy to be effective in managing this system.

Resources

The preparation of this poster was neither expensive nor particularly time consuming although it required some discussion to limit the content to 2 main concepts. The very nature of a poster means that it will generally be seen quickly, in a distracting environment and from a distance. Only if that experience is sufficiently rewarding is the viewer likely to invest more time and attention in decoding the content. The practice of restraint here was at odds with the desire to portray as much information as possible. The time

and effort to pare down the content and promote the importance of two main concepts was particularly well spent as it made a visible impact on the final poster.

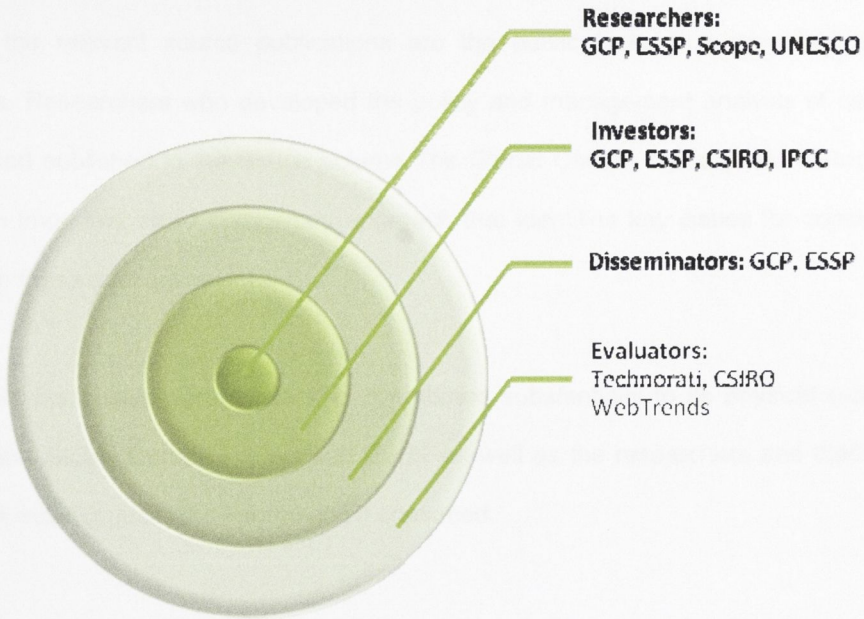
The ESSP conference organizers retained a central display area for their linked organizations and provided a general template for the posters with set dimensions and logos to give a consistent appearance across organisations. Rather than transport printed posters to China, they were sent electronically and printed in Beijing at a modest cost with ESSP covering the expense.

Agents

See figure 9 for the Dissemination pattern of the ESSP Conference Poster.

- **Researchers:** GCP, ESSP, Scope, UNESCO
- **Investors:** GCP, ESSP, CSIRO, IPCC
- **Disseminators:** GCP, ESSP
- **Evaluators:** Technorati, CSIRO WebTrends

Figure 9. Dissemination pattern: ESSP Conference Poster



Researchers in a number of international science organisations provided the information displayed on the poster. Research into the increases in growth of fossil-fuel emissions provided an analysis that was commissioned by UNESCO and presented at the COP12 climate talks in Nairobi that week. The authors listed on the relevant source publications are the public faces that represent the efforts of many colleagues. Researchers who developed the policy and management analysis of carbon-climate-human systems had published in the Scope volume *The Global Carbon Cycle* (Field & Raupach, 2004). They provide an important cross disciplinary approach that identifies key issues for consideration in effecting changes to these relationships.

Investors in the poster were those who contributed substantially to its physical production and display including the Global Carbon Project and ESSP as well as the researchers and their institutions that are invested in making public the information it contained.

Disseminators were the investors in this case with the addition of the few people who downloaded the file from the Global Carbon Project web site. There was no further physical dissemination of this poster which had limited reach past the thousand or so participants at the conference who might have seen it. In this case the targeted nature of the audience of scientists, educators and policy makers increased the potential impact of the poster as a ready facility to aid the ad hoc discussions that characterise such a meeting.

Evaluators are limited to personal mention and WebTrends although this file did not appear in the records of the top 95% of downloads for the November 2006-November 2007 period. While it was discussed and referred to over the length of the conference there was no process of evaluation that tracked any aspect of its impact. A possible positive effect might be that those who have seen the poster have a greater recognition of the content and import of these diagrams when the images are later seen in a broad public release.

4. Emissions Growth - Media Release

Artefact

Accessible on disc HERE or online at

<http://www.essp.org/en/media/press-releases/061110-press-releas-global-carbon.html>

<http://www.alphagalileo.org/index.cfm?fuseaction=readRelease&ag=1&ReleaseID=516542>

This was a media release, prepared and issued at an international conference and while not hosted on the Global Carbon Project website, it did direct interested parties to the website (see figure 10). The target audience was firstly journalists and media networks and secondly the policy makers who would be influenced by the media coverage of the findings.

Figure 10. Emissions Growth Media Release on AlphaGalileo

AlphaGalileo
The world's leading resource for European research news

View All Science Arts Technology Health Society Humanities

You are in: View all > Press Releases > Release

Register as a journalist for full access Register as a contributor to post your news

AlphaGalileo Home
About Us
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Expert service
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All content
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Press Releases Printable version

AWI HELMHOLTZ GEMEINSCHAFT

For further information, please contact:
Please register to view contact details

10 November 2006 New global analysis shows 400% increase in carbon dioxide emissions growth

The global growth in carbon dioxide emissions from fossil fuels was 4 times greater in the period between 2000 to 2005 than in the preceding 10 years, say scientists gathering in Beijing today for an international conference on global environmental change.

Despite efforts to reduce carbon emissions, the global growth rate in CO₂ was 3.2% in the five years to 2005 compared to 0.8% in the period 1990 to 1999, according to data soon to be published by the Global Carbon Project (www.globalcarbonproject.org), a component of the Earth System Science Partnership (www.essp.org).

"This is a very worrying sign," said Dr Mke Raupach, Chair of the Global Carbon Project. "It indicates that recent efforts to reduce emissions have virtually no impact on emissions growth and that effective caps are urgently needed."

Log-on to AlphaGalileo
Username
Password
Forgotten your password?
Register as journalist
Register as contributor

INTERNATIONAL 2007 & 2008 POLAR YEAR
All about Norway's contribution

Science

The core finding reported in this media announcement was that the global growth in carbon dioxide emissions from fossil fuels was 4 times greater in the period 2000 to 2005, than in the preceding 10 years. As is common with synthesis science, the data that fed into this was publicly available but the analyses had not been done previously. This analysis was commissioned by UNESCO (United Nations Educational, Scientific, and Cultural Organization) to be made available during the COP12 (known formally as the Twelfth Session of the Conference of the Parties to the UN Framework Convention on Climate Change) climate talks in Nairobi the following week. Presenting these findings at the ESSP conference in Beijing, Dr. Michael Raupach incorporated them into a larger presentation discussing the implications of the science as well as its substance. These findings were integrated into a paper published six months later in Proceedings of the National Academy of Science (M. R. Raupach et al., 2007), and is freely available through open access publishing (Full Text Article: Proceedings of the National Academy of Science - <http://www.pnas.org/cgi/reprint/0700609104v1>). Accessible on disc [HERE](#).

Opportunity

Many opportunities came together for this particular media announcement to have the large scale impact it generated. The timing coincided with two international events addressing global environmental change, the ESSP conference in Beijing and the COP12 meeting in Nairobi. The solid reputations of the scientists and their sponsoring institutions afforded credibility and a high degree of reliability to the findings. The ready connection across financial, environmental and social sectors gave this story broad appeal as well as the controversial reinforcement of the anthropogenic effect on increased atmospheric CO₂. The issue of science as news came into play with a request from [Nature On-line](#) for example, whose editors needed to make sure that the findings themselves were new and therefore news, in order to pick up the story.

These opportunities alone would not have been sufficient however if professional communicators were not available to bring the resources together and place the media release on a server within hours. Without

the additional assistance of Susannah Elliott, CEO of the Australian Science Media Centre (AUSSMC) who was attending the conference and the communicators from the other ESSP organisations, the deadline might well have been missed. In particular, access to AlphaGalileo, an internet press centre specializing in European research news is through subscription and would not have been available to us if not for the efforts of the German communicator, Mareile Wolff. She assisted us by making the Alfred Wegener Institute for Polar and Marine Research subscription available to upload the release.

Resources

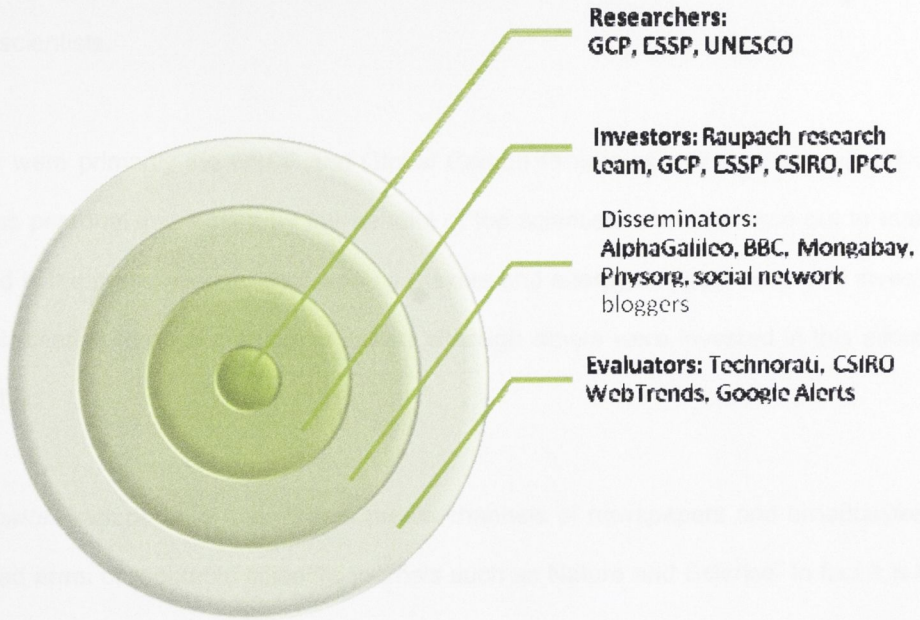
My presence at the conference incurred the cost of return airfare from Australia to Beijing and accommodation during the conference. Certainly the time of the scientists presenting talks and attending the conference was fully committed and a dedicated science communicator who was responsible for the press release was needed to see it through. The task was demanding, from attending the presentation and seeing the opportunity for a story, to writing the press release, gathering authoritative quotes, verifying content for public release from the institutions involved and making the release public, all of this while a one thousand person conference went on. Dr Raupach's keynote presentation was at 10:30 in the morning and the final release was uploaded to the AlphaGalileo media server at 7 pm. The first reporter requesting access to the scientists for interviews contacted me at 10:30 pm from the Independent newspaper in London followed by a reporter from a BBC morning radio show.

Agents

See figure 11 for the Dissemination pattern of the Emissions Growth Media Release.

- **Researchers:** GCP, ESSP, UNESCO
- **Investors:** Raupach research team, GCP, ESSP, CSIRO, IPCC
- **Disseminators:** AlphaGalileo, BBC, Mongabay, Physorg, social network bloggers
- **Evaluators:** Technorati, CSIRO WebTrends, Google Alerts

Figure 11. Dissemination pattern: Emissions Growth Media Release



Researchers in this case broadly include physical scientists, energy analysts and financial forecasters from around the world, although the UNESCO sponsored analysis was carried out by a small international group of scientists.

Investors were primarily the ESSP and Global Carbon Project as well as their supporting organizations. There was personal investment by the handful of top scientists who took time out to make statements to be quoted in the press release. Some policy makers and energy analysts were also invested in the spread of this information through credible channels although others were invested in this information not being made public.

Disseminators included the mainstream media channels of newspapers and broadcasters as well as the web based arms of reputable scientific journals such as Nature and Science. In fact it is the controversial nature of the analysis coupled with the concurrent international attention on climate change and the UNFCCC COP 12 meeting that increased the interest of the disseminators. This created a fast growth in interest as news services picked up the report of a 400% increase in the growth of fossil fuel emissions. This in turn led to vested interests in the energy sector and in environmental advocacy groups using this story to tell their own. Blog writers picked up the information as a topic for comment and further spread the message. The short attention span of these audiences and their ongoing search for news created a fairly strong media presence for a short time in comparison with the type of dissemination found in scientific journal where the information can have a very long relevance to a smaller audience.

Evaluators of the effects of this press release include my own tracking of the web for stories simply by doing a Google search periodically to see who had picked up the story. This was somewhat hampered because the Chinese internet would often block certain addresses, notably the BBC. It was sometimes possible to access the pages through address directories within the site because the block seemed to be applied through the Google search pages.

5. Science Publication – Media Release

Artefact

Accessible on disc HERE or online at Global Carbon Project media release (embargo lifted 10 May, 2007) on http://www.globalcarbonproject.org/misc/Science_Forest.htm. See figure 12 for an image of the web download page for the media release and press kit. The target audience was firstly journalists and media networks and secondly the policy makers who would be influenced by the media coverage of the findings.

Figure 12. Global Carbon Project link to Science article press release

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Activities
Meetings
Products
Science
Research Programs
Internet Resources

Tropical Forests and Climate Policy

A tropical forests and climate policy study in the journal *Science* highlights the importance of slowing deforestation in tropical countries in the global effort to avert dangerous climate change.

Gullison RE, Frumhoff PC, Canadell JG, Field CB, Nepstad DC, Hayhoe K, Avissar R, Curran LM, Friedlingstein, Jones CD, Nobre C (2007) [Tropical forests and climate change](#). *Science* 316: 985-986.


Analyses and Figures:

- [Science Article - Supporting online Material \(pdf 144kb\)](#)
- [PowerPoint presentation of figures \(ppt 1Mb\)](#)

Press Releases:

- [Global Carbon Project press release](#)
- [Union of Concerned Scientists](#)
- [Texas Tech University](#)
- [Carnegie Institution](#)
- [CSIRO](#)
- [GCP Digest of online press listings \(pdf 83kb\)](#)

Photos of Deforestation (available free if credited as specified)



Science

The article which is the subject of the press release is cited fully as Gullison RE, Frumhoff PC, Canadell JG, Field CB, Nepstad DC, Hayhoe K, Avissar R, Curran LM, Friedlingstein, Jones CD, Nobre C (2007) Tropical forests and climate change. *Science* 316: 985-986. It represents a synthesis analysis of tropical forest ecosystems in terms of both their effect on the global carbon cycle and their response to continued global environmental change. The findings have been presented in a policy relevant way by addressing the UNFCCC initiative to assess technical and scientific issues and new “policy approaches and positive incentives” for Reducing Emissions from Deforestation in developing countries or REDD (Gullison RE, 2007). This paper and online supporting documentation is available freely from the author’s home page on the Global Carbon Project website or by subscription from www.sciencemag.org.

Opportunity

This media release focused on the publication of the research results and took advantage of the stamp of authenticity that publication in a high impact peer reviewed journal confers. There were many months of submission and re-submission before it was accepted by *Science* so the publication timing was dictated by the schedule of the journal and coincided with a UNFCCC conference in Bonn. This was attended by around 1,800 participants and included discussions of deforestation initiatives in developing nations such as REDD (Reduced Emissions from Deforestation in Developing Countries). This brought the distant issue of tropical deforestation to immediate relevance in international policy discussions.

Resources

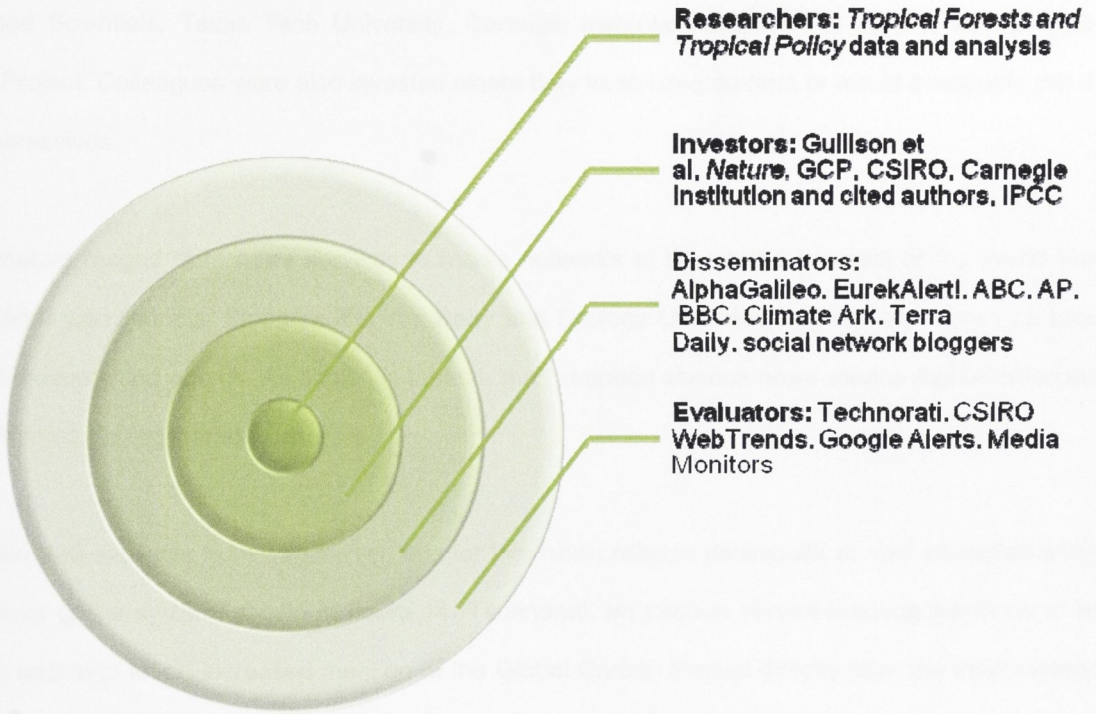
Because a communicator was available at the Global Carbon Project to coordinate the press releases and develop a dedicated web page for media resources, the very short time frame of media interest was catered to. This site made available copyright-free images, links to all press releases issued through the co-authors institutions as well as selected press reports as they came onto the internet.

Agents

See figure 13 for the Dissemination pattern of the Science Publication – Media Release.

- **Researchers:** *Tropical Forests and Tropical Policy* data and analysis
- **Investors:** Gullison et al, *Nature*, GCP, CSIRO, Carnegie Institution and cited authors, IPCC
- **Disseminators:** AlphaGalileo, EurekAlert!, ABC, AP, BBC, Climate Ark, Terra Daily, social network bloggers
- **Evaluators:** Technorati, CSIRO WebTrends, Google Alerts, Media Monitors

Figure 13. Dissemination pattern: Science Publication – Media Release



Researchers were represented superficially by the authors although they in turn represent the members of research projects and institutions.

Investors are seen through the press releases issued by the author's institutions including the Union of Concerned Scientists, Texas Tech University, Carnegie Institution and CSIRO as well as the Global Carbon Project. Colleagues were also invested where they were cited authors or would eventually cite the paper themselves.

Disseminators ranged from news services to media networks to the vested interests of the World Bank and All American Patriots. Bloggers like Vox Baby and Ecology Undernews carried the story to a broad range of interests and agents. As shown in table 4, the European science news service AlphaGalileo sent out 3678 emails to registered journalists.

Evaluation was available from web server logs for the media release downloads as well as statistics from the journals online system, shown in figure 14. Technorati, an internet service tracking mentions of key words in web logs found increased mention of the Global Carbon Project directly after the media release as shown in figure 15. In the longer term the impact of the article can be gauged through some traditional impact monitoring methods such as a citation index but that is quite separate from the media attention these findings garnered.

Table 4. *AlphaGalileo press notices: Science Publication – Media Release*

Date	Title	media emails	*other emails	totals	*page hits
18-May-07	New science highlights the promise of a new climate policy initiative by forest-rich developing countries.	3678	601	4279	106

*Other emails to press officers and experts

*Page hits may be quite low as many journalists receive the full text email alerts.

Figure 14. Web visits to GCP download page for Science Publication – Media Release



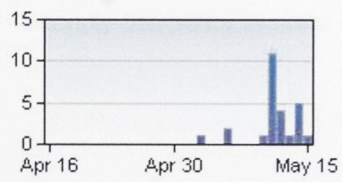
WebTrends visits - Number of visits that include a view of the specified document. Individual visitors are counted each time they come to the Web site, and are counted only once per visit no matter how many pages they look at. If a visitor is idle longer than the idle-time limit, WebTrends assumes the visit was voluntarily terminated. If the visitor continues to browse your site after they reach the idle-time limit, a new visit is counted.

Figure 15. Technorati web posts as at 16 May 2007

+ netvibes

Mentions by Day

Posts that contain "global carbon project" per day for the last 30 days.



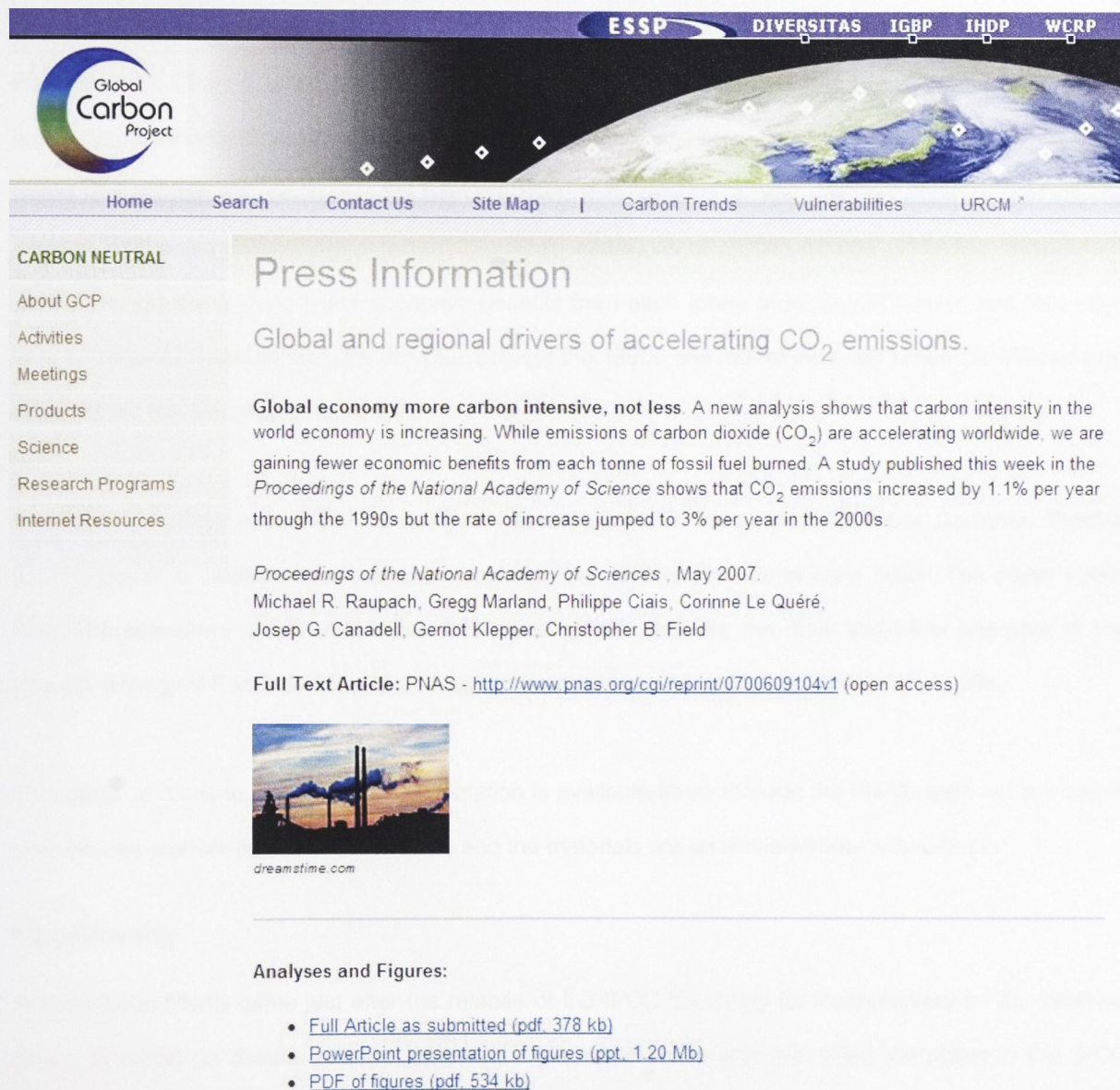
6. *PNAS* Publication May 2007– Media Release

Artefact

See Global Carbon Project media release (embargo lifted 22 May, 2007) accessible on disc HERE or online at http://www.globalcarbonproject.org/activities/PNAS_Article_May07.html. See figure 16 for an image of the web download page for the media release and press kit. The target audience was firstly journalists and media networks and secondly the policy makers who would be influenced by the media coverage of the findings.

Figure 16. Global Carbon Project link to Proceedings of the National Academy of Science May 2007

article press release



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- Science
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Press Information

Global and regional drivers of accelerating CO₂ emissions.

Global economy more carbon intensive, not less. A new analysis shows that carbon intensity in the world economy is increasing. While emissions of carbon dioxide (CO₂) are accelerating worldwide, we are gaining fewer economic benefits from each tonne of fossil fuel burned. A study published this week in the *Proceedings of the National Academy of Science* shows that CO₂ emissions increased by 1.1% per year through the 1990s but the rate of increase jumped to 3% per year in the 2000s.

Proceedings of the National Academy of Sciences, May 2007.
 Michael R. Raupach, Gregg Marland, Philippe Ciais, Corinne Le Quéré,
 Josep G. Canadell, Gernot Klepper, Christopher B. Field

Full Text Article: PNAS - <http://www.pnas.org/cgi/reprint/0700609104v1> (open access)



dreamstime.com

Analyses and Figures:

- [Full Article as submitted \(pdf, 378 kb\)](#)
- [PowerPoint presentation of figures \(ppt, 1.20 Mb\)](#)
- [PDF of figures \(pdf, 534 kb\)](#)

Science

The paper which is the subject of the press release is cited fully as Michael R. Raupach, Gregg Marland, Philippe Ciais, Corinne Le Quéré, Josep G. Canadell, Gernot Klepper, Christopher B. Field (2007) Global and regional drivers of accelerating CO₂ emissions *Proceedings of the National Academy of Sciences*, www.pnas.org/cgi/doi/10.1073/pnas.0700609104). It represents a new analysis showing that carbon intensity in the world economy is increasing. While emissions of carbon dioxide (CO₂) are accelerating worldwide, we are gaining fewer economic benefits from each tonne of fossil fuel burned and that while CO₂ emissions increased by 1.1% per year through the 1990s, the rate of increase jumped to 3% per year in the 2000s (M. Raupach et al., 2007)

In respect to policy relevance this analysis has an economic focus, relating Gross Domestic Product (GDP) figures to carbon emissions and calculating the carbon intensity of each dollar. The paper states that “The emissions growth rate since 2000 was greater than for the most fossil-fuel intensive of the Intergovernmental Panel on Climate Change emissions scenarios developed in the late 1990s.”

This paper and online supporting documentation is available freely through the PNAS open access option whereby the authors pay an additional fee and the materials are available without subscription.

Opportunity

Publication in PNAS came just after the release of the IPCC Summary for Policymakers for the Working Group III report on climate change mitigation. This made the references within the paper to the IPCC process very attractive to the media as well as offering an important contribution to the understanding of changes that have taken place in emissions trends since the cut-off date for published data to be included in the IPCC report. As with any publication in a highly cited peer reviewed journal the opportunity for inclusion did not just present itself but is the result of a long process of submission, rejection and revision building on the collective reputations of seven authors.

Resources

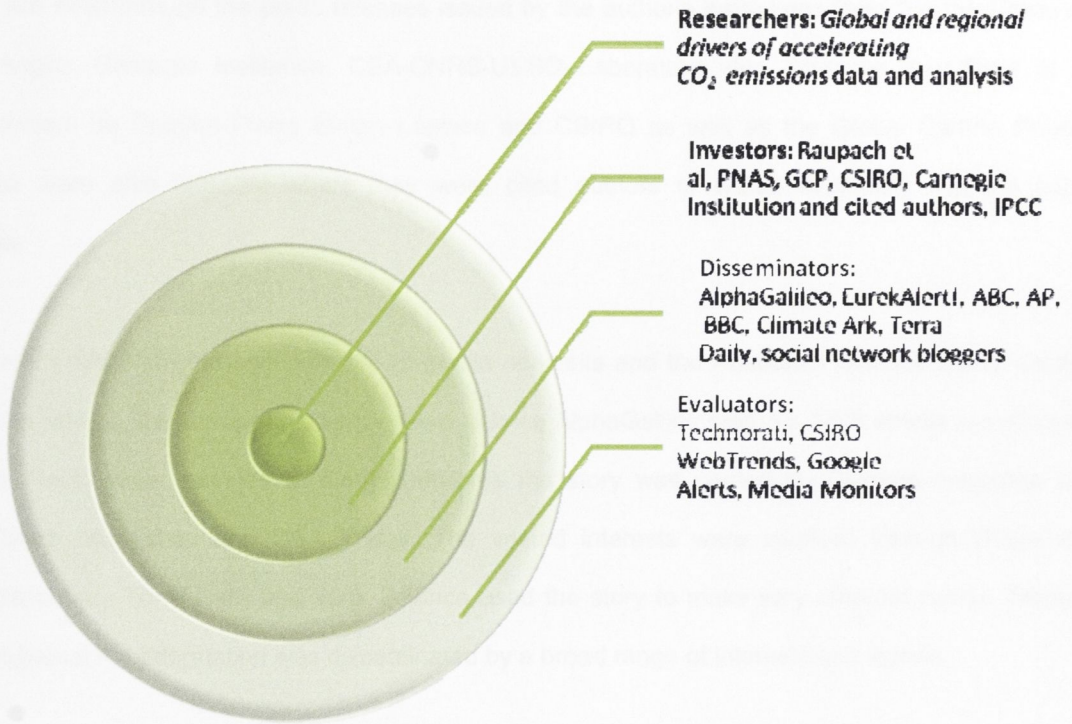
The publication of this paper within two weeks of the previously mentioned paper in *Nature* afforded both benefits and deficits. While on one hand the communications resources of the Global Carbon Project were stretched to coordinate and prepare two press kits, on the other hand there was an opportunity to use templates and make refinements from the earlier experience.

Agents

See figure 17 for the Dissemination pattern of the PNAS May 2007 Publication – Media Release.

- **Researchers:** *Global and regional drivers of accelerating CO₂ emissions* data and analysis
- **Investors:** Raupach et al, PNAS, GCP, CSIRO, Carnegie Institution and cited authors, IPCC
- **Disseminators:** AlphaGalileo, EurekAlert!, ABC, AP, BBC, Climate Ark, Terra Daily, social network bloggers
- **Evaluators:** Technorati, CSIRO WebTrends, Google Alerts, Media Monitors

Figure 17. Dissemination pattern: Proceedings of the National Academy of Science May 2007 Publication
– Media Release



Researchers were represented superficially by the authors; Michael R. Raupach, Gregg Marland, Philippe Ciais, Corinne Le Quéré, Josep G. Canadell, Gernot Klepper, Christopher B. Field, although they in turn represent the members of research projects and institutions.

Investors are seen through the press releases issued by the author's institutions including the University of East Anglia, Carnegie Institution, CEA-CNRS-UVSQ Laboratoire des Sciences du Climat et de l'Environnement de l'Institut Pierre Simon Laplace and CSIRO as well as the Global Carbon Project. Colleagues were also invested where they were cited authors or would eventually cite the paper themselves.

Disseminators ranged from news services to media networks and the Australian Science Media Centre. As shown in table 5, the European science news service AlphaGalileo sent out 3768 emails to registered journalists. From news services to media networks the story was carried by Cosmos magazine and Science Daily, Mongabay and USA Today. The vested interests were involved through ITwire and Thinking Mountain, Terra Daily and Junk Science used the story to make very different points. Through internet dispersal the information was disseminated by a broad range of interests and agents.

Evaluators came from web server logs for the media release downloads as well as statistics from the journals online system. In the longer term the impact of the article on subsequent scientific studies and analyses can be gauged through some traditional impact monitoring methods such as a citation index but that does not directly reflect the media attention these findings garnered.

Date	Title	media emails	*other emails	totals	*page hits
17-May-07	Global economy more carbon intensive not less	3768	659	4427	262

Table 5. *AlphaGalileo press notices: Proceedings of the National Academy of Science May 2007*

Publication – Media Release

*Other emails to press officers and experts

*Page hits may be quite low as many journalists receive the full text email alerts.

By using the WebTrends statistics we are able to see changes in the flow of visitors to the Global Carbon Project website download page for this press release, shown in figure 18. By looking at the daily traffic patterns for the month of May we see modest increases in overall web traffic coinciding with the release of the paper in Science (Artefact 5) compared with a substantial web traffic increase on the Proceedings of the National Academy of Science publication as indicated in figure 19.



WebTrends visits - Number of times that visitors view the page. Includes all visits, including repeat visits, but only counts the first visit to the Web site. The number of visits is calculated as the number of unique IP addresses that visit the page. If a visitor is also larger than the relative time. WebTrends measures the number of unique IP addresses that visit the page. If the visitor address is 0, then the visitor is not counted. The number of visits is calculated as the number of unique IP addresses that visit the page.

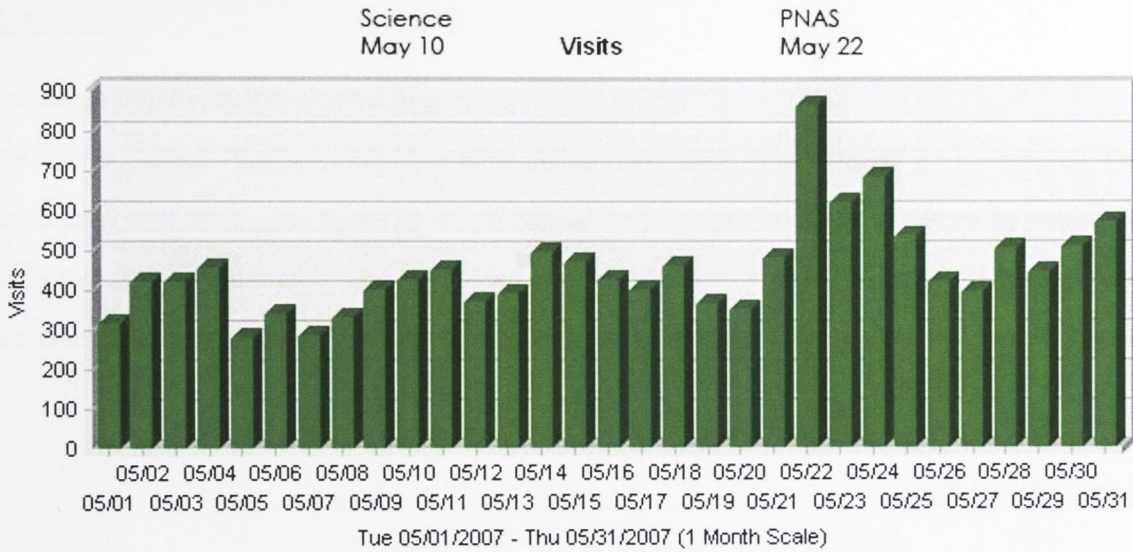
Figure 18. GCP download page visits for Proceedings of the National Academy of Science May 2007

Publication – Media Release



WebTrends visits - Number of visits that include a view of the specified document. Individual visitors are counted each time they come to the Web site, and are counted only once per visit no matter how many pages they look at. If a visitor is idle longer than the idle-time limit, WebTrends assumes the visit was voluntarily terminated. If the visitor continues to browse your site after they reach the idle-time limit, a new visit is counted.

Figure 19. WebTrends data for www.globalcarbonproject.org visits by day for May 2007.



Visits - Number of times a visitor came to your site. If a visitor is idle longer than the idle-time limit, WebTrends assumes the visit was voluntarily terminated. If the visitor continues to browse your site after they reach the idle-time limit, a new visit is counted. The default idle-time limit is thirty minutes.

7. Global Carbon Project web site redesign

Artefact

Accessible <http://www.globalcarbonproject.org>

The Global Carbon Project website has been active since 2002. See figure 19 for an image of the new home page web design and figure 20 for the original home page. The target audience for the web site is firstly the research scientists who work from and contribute to current research efforts and secondly professors, students and policy makers wishing access to the most recent information, data and graphics.

Figure 20. New web design – home page

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- About GCP
- Activities
- Meetings
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- Science
- Research Programs
- Internet Resources

The Global Carbon Project

The Global Carbon Project (GCP) was established in 2001 in recognition of the enormous scientific challenge and fundamentally critical nature of the issue for Earth sustainability.

The scientific goal of the project is to develop a complete picture of the global carbon cycle, including both its biophysical and human dimensions together with the interactions and feedbacks between them.




Job Opportunity

The Walker Institute for Climate Systems Research, Reading University has an upcoming post-doc position starting on 1 October 2007 to work on implementing a fire simulation module into the Joint UK Land Environment Simulator (JULES) under the supervision of Dr Allan Spessa, Reading University. This will be a 6 month position. See announcements.

[Download Carbon Cycle Policy Brief](#)

News and Job Announcements [[view all](#)]

Highlights

-  [Drivers of accelerating CO₂ emissions](#)
-  [Saturation of the Southern ocean CO₂ sink](#)
-  [Tropical Forests and Climate Policy](#)

© GCP 2001-2007 | Global Carbon Project | info@globalcarbonproject.org

Figure 21. Original web design – home page

Global Carbon Project

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What's New Sign-up Contact Credits Site Map

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MEMBER ZONE >

- About GCP >
- Who is Who >
- The Science >
- Activities >
- Meetings >
- Products >
- Support >

CARBON PORTAL >

The growing realization that anthropogenic climate change is a reality has focused the attention of the scientific community, policymakers and the general public on the rising concentration of greenhouse gases, especially carbon dioxide (CO₂) in the atmosphere, and on the carbon cycle in general.



Photo: Brian Stokes

Initial attempts, through the United Nations Framework Convention on Climate Change are underway to slow the rate of increase of greenhouse gases in the atmosphere.

The societal actions needed to address climate change require a scientific understanding of the carbon cycle, its interactions with climate, and the ways humans can influence its future trajectories.

In recognition of the enormous scientific challenge and fundamentally critical nature of the issue for Earth sustainability, the Global Carbon Project (GCP) was established in 2001.

The scientific goal of the project is to develop a complete picture of the global carbon cycle, including both its biophysical and human dimensions together with the interactions and feedbacks between them.

Tropical Forests and Climate Policy

Download

Carbon Cycle Research in Africa

24-26 August 2007
Kruger NP, Africa

GCP-Tsukuba

Science

The Global Carbon Project makes available a wealth of established fundamental and current findings regarding carbon science and carbon-climate-human interactions. This is achieved in large measure through their web site by hosting papers, presentations and data; maintaining a current listing of meetings, workshops and conferences, and by offering up-to-date links to high level web based sources of data and findings. The global nature of the Global Carbon Project means that the web site serves a diverse science community from institutional high speed internet connections which can handle large file sizes to rural and developing communities using slow and unstable dial-up internet connections.

The science information hosted on the site is chosen for its relevance to both the physical understanding of carbon cycling and the policy implications of anthropogenic effects. Particular attention is paid to findings that fill knowledge gaps regarding vulnerabilities in carbon-climate-human interactions (J. G. Canadell, Dickson, Raupach, & Young, 2003) By promoting the most recent progress in our understanding the Global Carbon Project fills an important niche in communication of current carbon science.

Opportunity

The Global Carbon Project web site had been professionally developed and then was maintained with part-time help from students. Initially this was sufficient to deliver the science support and international meeting information that was the core of the intended purpose of the site. Eventually the back end of the web site which remains unseen by the users became increasingly disorganised and the file sizes became bloated with information that was no longer accessible..

Because a communicator was available in the office, greater use was made of media releases which generated demand for additional pages. As the user traffic and volume of information and meetings increased the need to upgrade the web site to Cascading Style Sheets (CSS) became clear. This is a

system allowing improved accessibility to web information and separates the style of the presentation for each page from the content it conveys. The content rich nature of the Global Carbon Project website is one of its most attractive features and improved access was necessary to bring the website up to current standards.

This was also an opportunity to change the structure of the site including three new links appearing on all pages. A section was added relating to the growing initiatives behind becoming carbon neutral, a link was included to a Carbon Trends report which updates the annual carbon emissions budget, and a more prominent link was made to the Urban and Regional Carbon Management website hosted through our Japanese office.

I was fortunate to find an independent consultant who could provide the web site design needed which was beyond my abilities. This joint effort provided a website which can be maintained more easily, at a higher level, with smaller files and faster loading. It also facilitated a clean up of unnecessary files reducing the load on the server by over 10 gigabytes.

One important issue with the redesign of the website is the change of web address to many pages which created broken hyperlinks where other websites linked to the Global Carbon Project. Due to the continued increase in traffic to the site it seemed that making the change as soon as possible would afford time to have these repaired before too many additional links were forged. A notice was sent out to our parent and member organisations alerting them to the change and the home page address remained the same.

Resources

Initially there was concern that the cost of redesign would be prohibitive so the time spent in investigating options was an important input in the process. By having a clear map of what was needed in the end and a pragmatic view to how refined the culling of extraneous files had to be, the job was kept to manageable time and money commitments. Before the presence of a dedicated communications person at the Global

Carbon Project this project did not get the necessary attention so that a clear plan could be developed and the modest resources were not apportioned to the reconfiguration of the web site. This redesign required the input of 21 hours staff time and \$2,600AUD in consulting fees.

Agents

See figure 22 for the Dissemination pattern of the Global Carbon Project web site redesign.

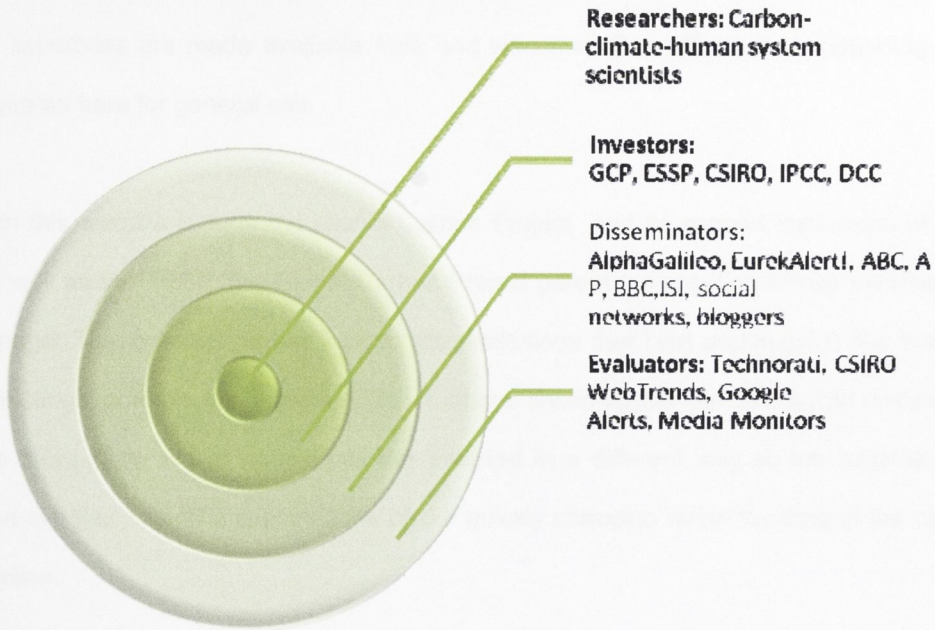
Researchers: Carbon-climate-human system scientists

Investors: GCP, ESSP, CSIRO, IPCC, DCC

Disseminators: AlphaGalileo, EurekAlert!, ABC, AP, BBC, ISI, social networks, bloggers

Evaluators: Technorati, CSIRO WebTrends, Google Alerts, Media Monitors

Figure 22. Dissemination pattern: Global Carbon Project web site redesign



Researchers are again the primary agents here, along with the institutions which support the research, its publication, and dissemination. This redesign affects the basic resource of the Global Carbon Project web site, its structure, content, accessibility and functionality. In this case the researchers are also primary users of the site which provides important communications within the carbon science community. Workshop schedules are made available here and workshop PowerPoint and supporting presentations are often posted here for general use.

Investors in this website include the Global Carbon Project and its support institutions of the DCC and CSIRO as well as the ESSP, the Global Carbon Project parent organisation whose member links appear on every page. The invested parties include the institutions that host and support the international and regional meetings, projects and activities described and linked on the site. The public and policy audience referred to more often in this case study are invested in a different way as the appetite increases for current and credible scientific explanations of our quickly changing understanding of the carbon-climate-human system.

Disseminators are a large and diverse group of individuals, institutions and organisations who both link to and link from the Global Carbon Project website. In addition to many links from related physical science research and policy organizations, Thompson Scientifics' ISI Web of Knowledge has recently included the Global Carbon Project website in its list of recommended sites for scientific research. In 2006 links to the Global Carbon Project website appeared as sidebars on articles posted online by the BBC, PNAS, Nature, Science and New Scientist. References to the Global Carbon Project website are imbedded in reports originating from science organizations as diverse as the International Council for Science, the US Climate Change Science Program as well as an Intergovernmental Panel on Climate Change (IPCC) Good Practice Guidance for LULUCF (Land use, land use change and forestry). Environmental advocates linking to the site include worldchanging.com, the Canadian Ecology Action Network and the Greater London Authority Environment News. Search engines such as Google, Yahoo! and MSN have proven to be the most popular entry points for the website.

Evaluators for the web site are primarily the statistical information program available from the web server hosting the site, in this case WebTrends. Figure 23 shows the total of unique visitors to the website by month with the largest number of different visitor in the months where press releases were issued. On the populist end of the spectrum Technorati, the web log or blog evaluators, listed 73 blogs that linked to <http://www.globalcarbonproject.org> on 25 September 2007. On the same day they also listed 123 blog entries citing the Global Carbon Project in French, German, Spanish, Catalan, Chinese, Indonesian and English.

Figure 23. WebTrends report Global Carbon Project website unique visitors



8. *Carbon Reductions and Offsets Report*

Artefact

Accessible on disc HERE or online at Global Carbon Project website:

<http://www.globalcarbonproject.org/carbonneutral>

This 34 page referenced report is aimed at the science community and is available to the public through the Global Carbon Project website carbon neutral page. See figure 24 for an image of the cover and figure 25 for the Carbon Neutral website which hosts the document for download within the Global Carbon Project web site. The document evaluated carbon footprint calculators; voluntary carbon offsets strengths and weaknesses; offset effectiveness in carbon-climate-human systems; emission responsibility and ownership; reliability and authenticity indicators (Coulter, Canadell, & Dhakal, 2007). The audience for the report grew from the Earth System Science Partnership member organisations to include the broader public searching for critical discussion on the use of voluntary carbon offsets.

Figure 24. Cover, *Carbon Offsets and Reductions* report



Figure 25. Cover, *Carbon Offsets and Reductions* report

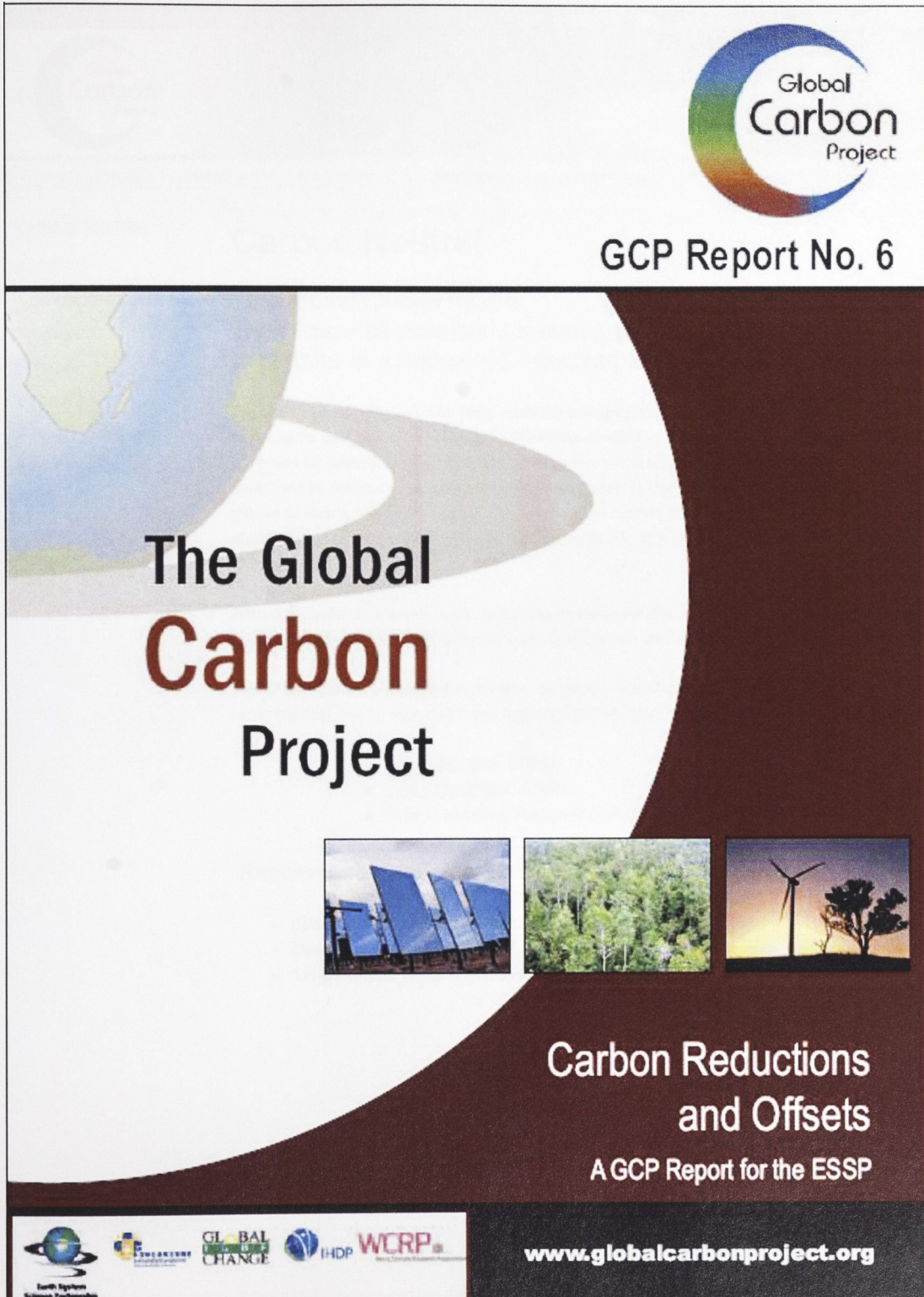
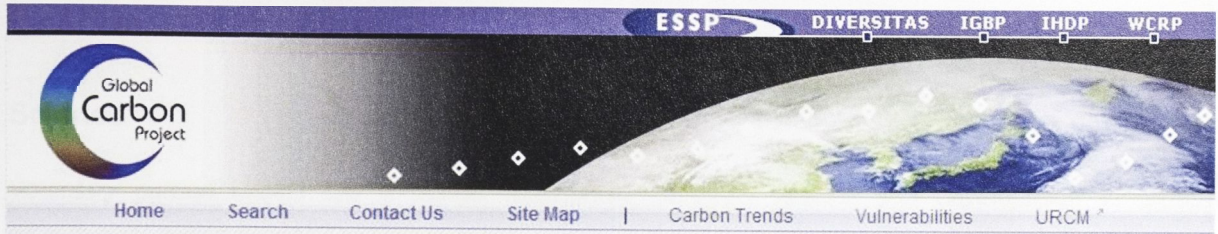


Figure 25. Global Carbon Project link to *Carbon Offsets and Reductions*



CARBON NEUTRAL

- About GCP
- Activities
- Meetings
- Products
- Science
- Research Programs
- Internet Resources

Carbon Neutral

To become carbon neutral, first reduce all possible emissions and impacts and then contribute to a measured reduction elsewhere to balance the rest

We are faced with the need for large reductions in greenhouse gases emissions over this century in order to minimize dangerous anthropogenic interference with the climate system. Outside of legally binding schemes for emission reductions such as the Kyoto Protocol, individuals and organisations can contribute to emission reductions by voluntarily reducing their demand for energy and purchasing carbon offsets to balance their emissions. The purchase of carbon offsets is part of a rapidly growing voluntary market helping to reduce the climate impact of specific activities to zero, otherwise known as becoming carbon neutral.

Although useful on a small scale, a growing increases in the voluntary carbon offset market will make its largest contribution by facilitating the rapid development and adoption of legally bidding policies.

The Global Carbon Project has published the report "Carbon Reductions and Offsets" with a number of recommendations for individuals and institutions who want to participate in this voluntary market.

- [Full Report](#) (pdf, 510kb)
- [Presentation](#) (ppt, 609kb)
- Fully hyperlinked Recommendations for additional information (see below)

Recommendations from *Carbon reductions and offsets*

- Carbon offsets are an important [early step](#).
- Choose comprehensive [carbon calculators](#).
- Set [meaningful limits](#) of responsibility.

Science

Voluntary carbon offsets are a market mechanism to direct funding and development to reduce atmospheric CO₂ by supporting a global low carbon economy. Essentially a carbon offset is achieved by balancing carbon emissions in one place by making an equivalent reduction elsewhere. Because there is no governing body certifying the validity of claims and the effectiveness of projects to actually reduce atmospheric CO₂ a need was seen to explain the science behind the mechanisms and recommend criteria for selecting valid offsets.

Some of the science issues explored include calculation differences across providers due to disparity in the application of radiative forcing (RF) for emissions and global warming potential (GWP) of different greenhouse gases as well as carbon sequestration vulnerabilities and their unintended negative impacts. There was a comparison of offset effectiveness in relation to larger carbon-climate-human interactions, integration into a systems approach and an explanation of the common criteria for valid offsets including additionality, leakage, permanence, verification and efficiency.

Evaluation of the effectiveness of any particular offset initiative depends on understanding the scientific principles involved. This document was prepared with the ESSP as the primary audience and focused on bringing understanding of the physical science in line with the critical application of these principals in choosing valid offsets.

Opportunity

Voluntary carbon offsets were of interest to the Global Carbon Project early in 2006 but lack of financing and personnel were obstacles to undertaking a comprehensive report and recommendations. A plan for the report was submitted to the Scientific Steering Committee Meeting of the Global Carbon Project, 31 August - 2 September, 2006 in Mexico City. The demand for this report continued to grow as it was being prepared during a period of rapid growth in both public awareness of the need to reduce atmospheric CO₂

and uptake of voluntary offsets as a mechanism. Because the ESSP member organisation, WCRP have shown leadership by using offsets since August 2006 the opportunity was there to build on their leadership. The basic aim of the document is to communicate the substance of the offset mechanism and facilitate the incorporation of effective carbon offsetting in organisational planning in the sciences.

Resources

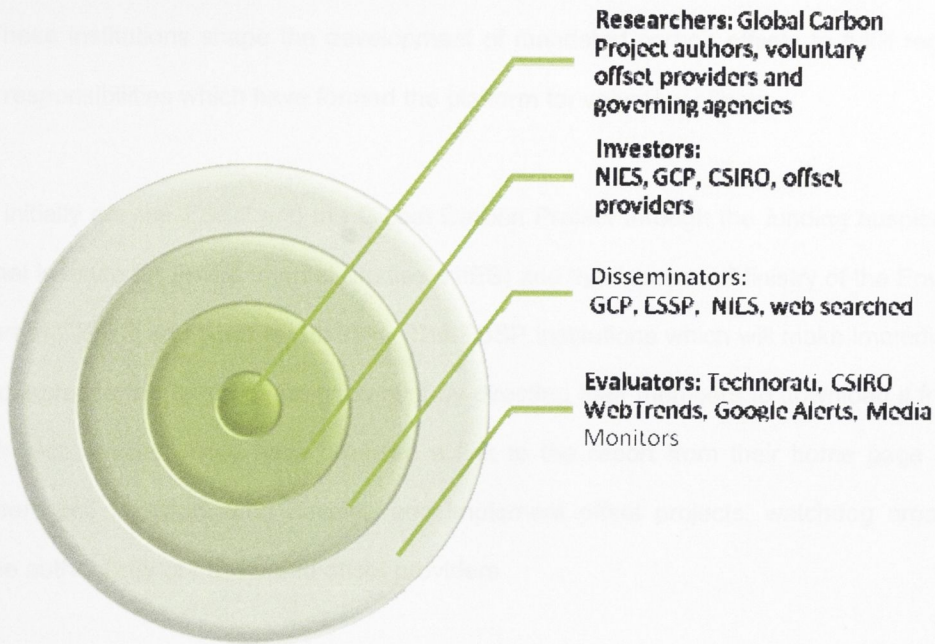
In late 2006 funding became available from the National Institute for Environmental Studies (NIES) in Japan which hosts the Global Carbon Project Japanese office. At the same time my presence at the Canberra office made it possible to have the research completed in Australia. While an initial time line was created showing a completion date of February 2007, the draft report was released in July 2007, with a final print ready version posted online in January 2008 . The later completion was due in part to other demands on the communicator's time and ongoing development of potential standards. Further initiatives to promote the report include an expanded web presence though a dedicated subsection of the website and items in ESSP member organisation newsletters as well as an official launch and media release. Due to the acceptance of the draft report by the ESSP, funds have been allocated to publish the report as GCP Report No.6.

Agents

See figure 26 for the Dissemination pattern of the Carbon Reduction and Offset Report.

- **Researchers:** Global Carbon Project authors, voluntary offset providers and governing agencies
- **Investors:** NIES, GCP, CSIRO, offset providers
- **Disseminators:** GCP, ESSP, NIES, web searched
- **Evaluators:** Technorati, CSIRO WebTrends, Google Alerts, Media Monitors

Figure 26. Dissemination pattern: Carbon Reduction and Offset Report



Dissemination of the report has increased by placing it on the Global Carbon Project website that is dedicated to carbon neutral information. This makes it immediately available to anyone with internet and e-mail access. This section of the website has been enhanced and a media centre page will be created to generate interest. Until this additional publicity is accomplished it is unlikely to be widely disseminated through social networks and varied interests which would generally come back toward the report through media and news channels.

Comments will be via web access software from the Global Carbon Project server as well as a more formal feedback from email requests and comments. If there is greater interest other evaluation software formats will open into play.

Researchers began with those who defined offsets and instituted the criteria of additionality, leakage, permanence, verification and unique accounting grew out of the Clean Development Mechanisms of the UNFCCC and the Greenhouse Gas Protocol as informed by the International Panel on Climate Change (IPCC). These institutions shape the development of mandated carbon offsets to fulfill regulated carbon reduction responsibilities which have formed the platform for voluntary offsets.

Investors initially are the ESSP and the Global Carbon Project through the funding auspices in Japan of the National Institute for Environmental Studies (NIES) and the Japanese Ministry of the Environment, and the support of CSIRO and AGO in Australia. The ESSP institutions which will make immediate use of this report also increase the reach of the document by directing their members to download it from the Global Carbon Project website. They have provided a link to the report from their home page as well. More broadly there are investors who develop and implement offset projects, watchdog organizations that monitor the authenticity of offsets and offset providers

Disseminators of the report have increased by placing it on the Global Carbon Project website from a dedicated link to carbon neutral information. This makes it theoretically available to anyone with computer and internet access. This section of the website has been expanded and a media release sent out to generate interest. Until this additional publicity is accomplished it is unlikely to be broadly disseminated through social networks and vested interests which would generally only know about the report through media and news channels.

Evaluators will be the web access software from the Global Carbon Project server as well as a more informal feedback from email requests and comments. If there is greater interest other evaluators such as Technorati will come into play.

9. Carbon Offset Workshop Presentation – Barcelona

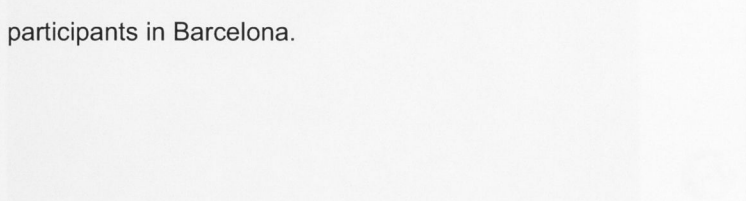
Artefact

Accessible on disc HERE or online at [http://www.cuimpb.es/uploads/ponencias/133Carbon Offsets.ppt](http://www.cuimpb.es/uploads/ponencias/133Carbon%20Offsets.ppt)

Workshop notice on

<http://www.cuimpb.es/frameset.html?lang=esp&accio=webNovedad&p1=id&v1=86&p2=otras&v2=N>

This PowerPoint file represents a workshop presentation delivered in Barcelona, Spain based on the study developed for the preceding artefact, the Carbon Offsets and Reductions report. See figure 27 for first and last images of the PowerPoint presentation. The audience for the presentation was the workshop participants in Barcelona.



Carbon offsets are one
important mechanism to start
reducing carbon emissions

today.

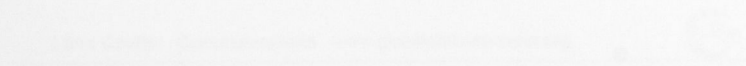


Figure 27. First and final slides in Carbon Offsets Presentation



Carbon-offsets are one
important mechanism to start
reducing carbon emissions

today.



This PowerPoint presentation was the visual guide for the seminar delivered as part of the summer school programme at the Centro de Cultura Contemporánea de Barcelona (CCCB), part of the Universidad Internacional Menéndez Pelayo in Barcelona. Some of the images were taken in the city to develop a sense of place in the presentation and the emotional and personal were favoured over the presentation of data. Titled “Carbono neutral: Estrategias voluntarias de actuación ante el cambio climático” in the program, my talk was entirely in English with a simultaneous translation into Spanish.

Science

This presentation focused on the concepts behind voluntary carbon offsets as a mechanism to reduce carbon emissions in society and the criteria for their effective selection. The first half of the presentation involved personalising the impacts of climate change, atmospheric CO₂ and voluntary change. The more technical aspect of the explanation involved graphic representations of the criteria that define valid carbon offsets: additionality, permanence, leakage and verification. The aspects to look for in an offset provider was highlighted and the accounting for carbon emissions in the workshop were used as an specific example of the process.

Opportunity

The director of the Global Carbon Project, Pep Canadell, was approached to present this workshop to coincide with a family visit to the area. The overall programme included concise presentations on the latest developments in the scientific understanding of carbon emissions as well as information from high level policy practitioners in the European Union. I was invited to present on the more personal aspect of voluntary offset schemes in recognition of the anticipated audience of graduate students and regional practitioners who might seek climate change mitigation solutions on a small scale. Having just completed a report mentioned above on voluntary carbon offsets I was well acquainted with the issues and science behind this market mechanism.

Resources

On one hand the resources for this presentation were high in comparison with other initiatives because it involved a return airfare from Canberra to Barcelona, for myself and for Pep Canadell who developed the workshop content as well as giving his own high presentations.. On the other hand the funding was provided in full by the sponsoring university. In the context of the Global Carbon Project, where international travel for presentations and meetings is an essential aspect of addressing the mandate to foster international synthesis research, this particular travel was not out of the norm.

Agents

See figure 28 for the Dissemination pattern of the Carbon Offset Workshop Presentation in Barcelona, Spain.

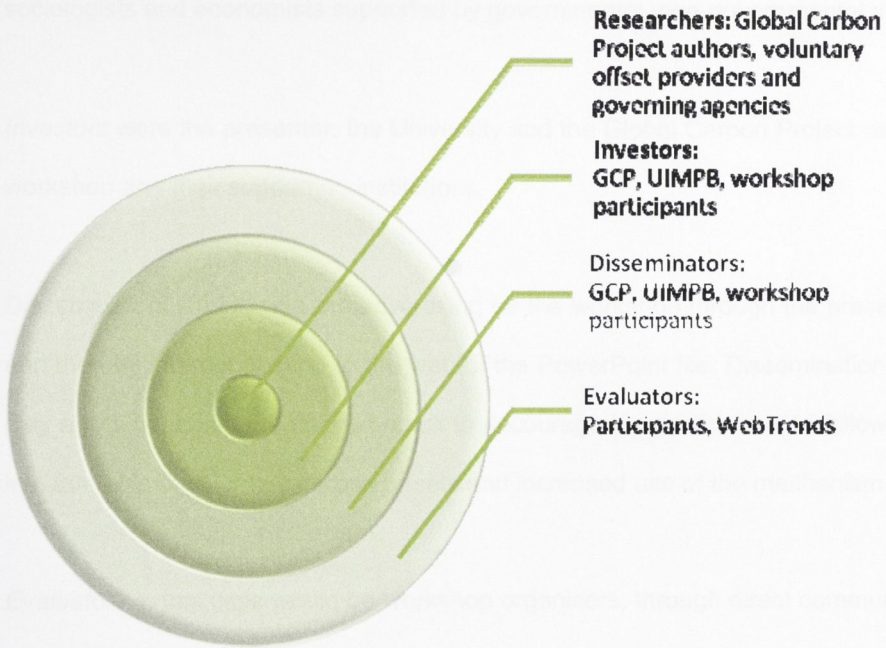
Researchers: Global Carbon Project authors, voluntary offset providers and governing agencies

Investors: GCP, UIMPB, workshop participants

Disseminators: GCP, UIMPB, workshop participants

Evaluators: Participants, WebTrends

Figure 28. Dissemination pattern: Carbon Offset Workshop Presentation – Barcelona



Researchers in this case were represented by the presenter as the talk was based on my recent report about voluntary carbon offsets. The report in turn represented the research of many scientists, sociologists and economists supported by governmental, non-governmental and business concerns.

Investors were the presenter, the University and the Global Carbon Project as well as the attendees of the workshop and their supporting institutions.

Disseminators started with the advertising for the workshop through the presentation to an audience of 48 and then by internet posting to the web of the PowerPoint file. Dissemination through word of mouth may play a role here with the desired result to encourage the participants to follow up with further investigation into the topic of voluntary carbon offsets and increased use of the mechanism.

Evaluators in this case would be workshop organisers, through direct communication from participants, as well as any web server software counting the number of downloads of the presentation. Certainly this presentation caused the greatest amount of emotional reaction in the ensuing discussions from the floor, based generally on the concern over the effectiveness of offset practices.

10. *PNAS* Publication October 2007 – Media Release

Artefact

Accessible on disc HERE or online at Global Carbon Project media release (embargo lifted 22 October, 2007) on

<http://www.globalcarbonproject.org/activities/AcceleratingAtmosphericCO2.htm>. See figure 29 for an image of the web download page for the media release and press kit. The target audience was firstly journalists and media networks and secondly the policy makers who would be influenced by the media coverage of the findings.

Figure 29. Global Carbon Project link to Proceedings of the National Academy of Science October 2007 article press release

The page was last updated on 25 October 2007. [Contact Us](#) [Feedback](#) [Privacy Policy](#)

Global Carbon Project

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CARBON NEUTRAL

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- Science
- Research Programs
- Internet Resources

Press information

Contributions to accelerating atmospheric CO₂ growth from economic activity, carbon intensity, and efficiency of natural sinks

Proceedings of the National Academy of Sciences (PNAS), published October 25, 2007, 10.1073/pnas.0702737104, Online Early Edition

Josep G. Canadell, Corinne Le Quere, Michael R. Raupach, Christopher B. Field, Erik T. Buitenhuis, Philippe Ciais, Thomas J. Conway, Nathan P. Gillett, R. A. Houghton, and Gregg Marland.

Carbon sink slowdown contributing to rapid growth in atmospheric CO₂

This study finds that the recent swift increase in atmospheric CO₂ is due to faster economic growth coupled with a halt in carbon intensity reductions, in addition to natural sinks removing a smaller proportion of emissions from the air. Efficiency of natural sinks to remove emissions from human activities has been declining for 50 years.

While rising anthropogenic emissions due to increased economic growth have been established as the driver of accelerated atmospheric CO₂ this study shows that both the slow down of natural sinks and the halt to improvements in carbon intensity are contributing more than one third of the increase.

Analyses and Figures

- [Download paper from PNAS Early Edition \(open access\)](#)
- Download a full PPT presentation with recent carbon trends and the global carbon budget updated to 2006.

Science

The paper which is the subject of the press release is cited fully as Josep G. Canadell, Corinne Le Quere, Michael R. Raupach, Christopher B. Field, Erik T. Buitenhuis, Philippe Ciais, Thomas J. Conway, Nathan P. Gillett, R. A. Houghton, and Gregg Marland. (2007). Contributions to accelerating atmospheric CO₂ growth from economic activity, carbon intensity, and efficiency of natural sinks. Proceedings of the National Academy of Sciences, Online Early Edition. This study finds that the recent swift increase in atmospheric CO₂ is due to faster economic growth coupled with a halt in carbon intensity reductions, in addition to natural sinks removing a smaller proportion of emissions from the air and that efficiency of natural sinks to remove emissions from human activities has been declining for 50 years (Josep G. Canadell et al., 2007).

Opportunity

PNAS scheduled the publication for this paper during the lead up to the release of The IPCC Synthesis Report which was launched in Valencia, Spain, on 17 November 2007. This was the result of many revisions and resubmissions and the final publication date was only known a few days in advance. With the great international attention that the upcoming IPCC announcement generated and the residual attention from the PNAS paper referred to in artefact 6 of this case study, this publication took advantage of an opportunity for increased attention to these results, generated through a unique set of circumstances.

Resources

Many of the resources for this media release were developed over the preceding year though the increased experience I had gained in writing media releases and preparing supporting materials for the web. The re-design of the website made it easier to manage for the Global Carbon Project and easier to reach for the public. The Global Carbon Project now has their own subscription to AlphaGalileo and was

able to arrange a WebEX press conference through the Australian Science Media Centre (AusSMC). Again the paper was made freely available though the payment of an open access fee.

Agents

See figure 30 for the Dissemination pattern of the Proceedings of the National Academy of Science October 2007 Publication – Media Release.

Researchers: Contributors to accelerating atmospheric CO₂ data and analysis

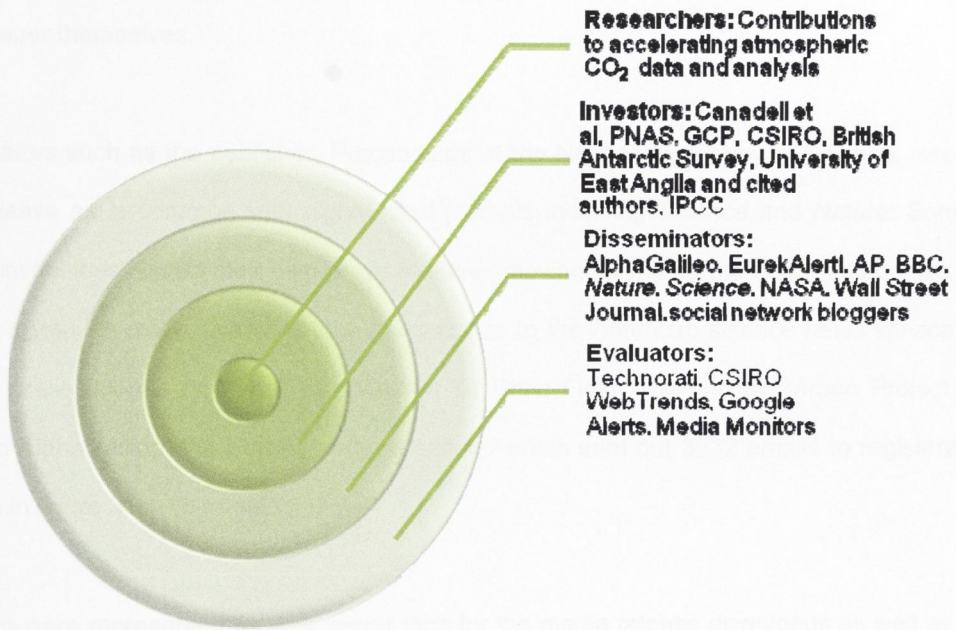
Investors: Canadell et al, PNAS, GCP, CSIRO, British Antarctic Survey, University of East Anglia and cited authors, IPCC

Disseminators: AlphaGalileo, EurekAlert!, AP, BBC, *Nature*, *Science*, NASA, Wall Street Journal, social network bloggers

Evaluators: Technorati, CSIRO WebTrends, Google Alerts, Media Monitors

Figure 30. Dissemination pattern: Proceedings of the National Academy of Science October 2007

Publication – Media Release



Researchers were represented by the authors and their research projects and institutions. The synthesis of the findings develops in part from the foundation of research mentioned earlier in this case study.

Investors begin with author's institutions including the British Antarctic Survey, University of East Anglia, Laboratoire des sciences du climat et de l'environnement (CEA-CNRS-UVSQ), and CSIRO as well as the Global Carbon Project. Colleagues were also invested where they were cited authors or would eventually cite the paper themselves.

Disseminators such as the publisher, Proceedings of the National Academy of Science, issued their own media release as is common with highly cited journals including *Science* and *Nature*. Some of the the invested institutions issued their own press releases moving them into the disseminator role as well. The Carnegie Institution made available their subscription to the American science news service EurekAlert!, issuing a press release on behalf of co-author Dr Chris Field. The Global Carbon Project submitted a release to AlphaGalileo, the European news service which sent out 3532 emails to registered journalists as shown in figure 31.

Evaluators were represented by web server logs for the media release downloads as well as statistics for the entire web site. Figure 32, showing overall website activity, portrays a clear relationship between media releases and general interest in the Global Carbon Project Website bearing in mind that an email newsletter was sent out in February to the complete Global Carbon Project data base of almost 3000 web addresses. Through Google Alerts and web searches including some non-English entries, over 150 separate web stories were found, generated from this paper (Link [HERE](#) to PowerPoint File containing web images).

Figure 31. AlphaGalileo press notices: Proceedings of the National Academy of Science October 2007

Publication – Media Release

AlphaGalileo
The world's leading resource for European research news

View All Science Arts Technology Health Society Humanities

You are in: Science » My Releases

AlphaGalileo Home
About Us
Science Home
Press Releases
Calendar
Books
Library
Links
Broadcast media
Expert service
Address book
Add or edit...
Release
Calendar event
Book
Library item
Broadcast media

My AlphaGalileo
Edit my details
Edit languages/alerts

Search

All sections
All content
GO

Advanced search

Press notices

To edit an item, click on a title below.

* Other emails: Emails to press officers and experts
* Page hits: Number of visits to this page. Note that this can be relatively low, as many journalists receive the full text by e-mail alert

Displaying items 1-6 of 6

Date	#	Title	Media emails	* Other emails	Emails (total)	* Page hits
31 Dec 2007	#	Carbon sink capacity in northern forests reduced by global warming	3439	450	3889	171
18 Oct 2007	#	Carbon sink slowdown contributing to rapid growth in atmospheric CO2	3532	636	4168	262
17 Aug 2007	#	EU supported research symposium focused on interaction of climate change and human activity in the African continent - media information	3139	518	3657	243
18 May 2007	#	New science highlights the promise of a major climate policy initiative by forest-rich developing countries.	3678	601	4279	106
17 May 2007	#	Test release by the software developers - please ignore	3768	659	4427	262
17 May 2007	#	Global economy more carbon intensive, not less	3768	659	4427	262

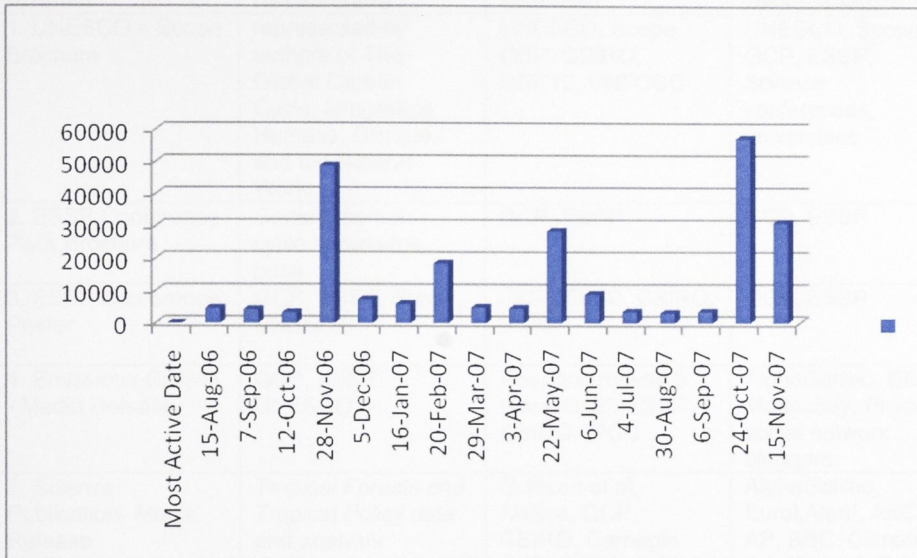
Home | Press Releases | Calendar | Books | Library | Links | Expert service | Address book | Advanced search
My AlphaGalileo... | Edit my details | Edit languages/alerts
Add or edit... Release | Calendar event | Book | Library item

Date	Title	media emails	*other emails	totals	*page hits
18-Oct-07	Carbon sink slowdown contributing to rapid growth in Atmospheric CO2	3532	636	4168	262

*Other emails to press officers and experts

*Page hits may be quite low as many journalists receive the full text email alerts.

Figure 32. Global Carbon Project web site peak activity per month



Hit - A single action on the Web server as it appears in the log file. A visitor downloading a single file is logged as a single hit, while a visitor requesting a Web page including two images registers as three hits on the server; one hit is the request for the .html page, and two additional hits are requests for the downloaded image files. While the volume of hits is an indicator of Web server traffic, it is not an accurate reflection of how many pages are being looked at.

Artefact	Researchers	Investors	Disseminators	Evaluators
1. UNESCO – Scope Brochure	represented by authors of The Global Carbon Cycle: Integrating Humans, Climate, and the Natural World.	UNESCO, Scope, GCP, CSIRO, COP12, UNFCCC	UNESCO, Scope, GCP, ESSP, Science conferences, universities	Technorati, CSIRO WebTrends
2. ESSP Conference Pack Brochure	General carbon cycle knowledge base	GCP, ESSP	GCP, ESSP	WebTrends
3. ESSP Conference Poster	GCP, ESSP, Scope, UNESCO	GCP, ESSP, CSIRO, IPCC	GCP, ESSP	Technorati, WebTrends
4. Emissions Growth - Media Release	GCP, ESSP, UNESCO	Raupach research team, GCP, ESSP, CSIRO, IPCC	AlphaGalileo, BBC, Mongabay, Physorg, social network bloggers	Technorati, WebTrends, Google Alerts
5. Science Publication- Media Release	<i>Tropical Forests and Tropical Policy</i> data and analysis	Gullison et al, <i>Nature</i> , GCP, CSIRO, Carnegie Institution and cited authors, IPCC	AlphaGalileo, EurekAlert!, ABC, AP, BBC, Climate Ark, Terra Daily, social network bloggers	Technorati, WebTrends, Google Alerts, Media Monitors
6. PNAS Publication May 2007– Media Release	<i>Global and regional drivers of accelerating CO₂ emissions</i> data and analysis	Raupach et al, PNAS, GCP, CSIRO, Carnegie Institution and cited authors, IPCC	AlphaGalileo, EurekAlert!, ABC, AP, BBC, Climate Ark, Terra Daily, social network bloggers	Technorati, CSIRO WebTrends, Google Alerts, Media Monitors
7. Global Carbon Project web site redesign	Carbon-climate-human system scientists	GCP, ESSP, CSIRO, IPCC, DCC	AlphaGalileo, EurekAlert!, ABC, AP, BBC, ISI, social networks, bloggers	Technorati, WebTrends, Google Alerts, Media Monitors
8. Carbon Reductions and Offsets Report	GCP authors, voluntary offset providers and governing agencies	NIES, GCP, CSIRO, offset providers	GCP, ESSP, NIES, web searched	Technorati, WebTrends, Google Alerts, Media Monitors
9. Carbon Offset Workshop Presentation – Barcelona	Global Carbon Project authors, voluntary offset providers and governing agencies	GCP, UIMPB, workshop participants	GCP, UIMPB, workshop participants	Participants, WebTrends
10. PNAS Publication October 2007 – Media Release	Contributors to accelerating atmospheric CO ₂ data and analysis	Canadell et al, PNAS, GCP, CSIRO, British Antarctic Survey, University of East Anglia and cited authors, IPCC	AlphaGalileo, EurekAlert!, AP, BBC, <i>Nature</i> , <i>Science</i> , NASA, Wall Street Journal, social network bloggers	Technorati, WebTrends, Google Alerts, Media Monitors

Table 6. Artefacts and agents summary

Discussion

Strategic communication is viewed in a number of many ways but the very latest understanding is strategic. The communication process creates products that are used to carry the messages which, if well crafted, will be passed on to others as a topic for news, discussion and decision-making. Particular communication issues arise with global environmental change especially due to species decline. First, specialized scientific vocabulary and the structure of scientific enquiry can be a barrier to understanding even within the scientific community. Secondly, the ethical, economic, and political context of environmental issues can leave the messages and preclude the audience, and finally, the scope and profound impact of anthropogenic global environmental change has very recently created a large and diverse international audience with an urgent interest in these findings.

The arena of communication model identifies four categories of actors in the communication process: Researchers, Investors, Disseminators and Evaluators. While traditional models of news flow do not focus on how the news was created, the very nature of communicating scientific findings is based in the research process. The work of the researchers is largely invisible except to other scientists. It is their results that create the messages and these results attract the funding and interest of the investors who will support the continued research and the communication of results. The credibility of the science underpins the acceptance of the messages. The investors are donors and organizations, institutions and peer review boards who support and prepare the research findings and their interpretation. Staff supported by the GCF, CSIRO, ESOP, government and non-government organizations, and including the journal *Science*, *Nature* and the Proceedings of the National Academy of Sciences, have all made substantial contributions to the communication of the Global Carbon Project and are an important part of the strategic process.

The general dissemination of the information once it has been released is no longer in the hands of the researchers and investors, but is distributed through both formal and social networks depending on their interests. It is in the preparation for that release that professional communicators, graphic designers and

Discussion

Strategic communication in science is a process in many ways like any other communications strategy. The communication process creates artefacts that are used to carry the message which, if accepted, will be passed on to others as a topic for news, discussion and decision making. Particular communication issues arise with global environmental change science due to special factors. First, specialised scientific vocabulary and the structure of scientific enquiry can be a barrier to understanding even within the scientific community, secondly, the emotive, economic, and political context of environmental issues can frame the messages and prejudice the audience, and thirdly, the speed and profound impact of anthropogenic global environmental change has very recently created a large and diverse international audience with an urgent interest in these findings.

The agents of communication model identifies four categories of actors in the communications process; Researchers, Investors, Disseminators and Evaluators. While traditional models of news flow do not focus on how the news was created, the very nature of communicating scientific findings is founded in the research process. The work of the researchers is largely invisible except to other scientists. It is their results that create the messages and these results attract the funding and interest of the investors who will support the continued research and the communication of results. The credibility of the science underpins the acceptance of the messages. The Investors are authors and organisations, institutions and peer review panels who support and prepare the research findings and their interpretation. Staff supported by the GCP, CSIRO, ESSP, government and non-government organisations, and including the journals *Science*, *Nature* and the *Proceedings of the National Academy of Science*, have all made substantial investments in the communications of the Global Carbon Project and are an important part of the strategic process.

The actual dissemination of the information once it has been released is no longer in the hands of the researchers and investors, but is distributed through both formal and social networks depending on their interests. It is in the preparation for that release that professional communicators, graphic designers and

media liaisons make their greatest contribution. If the researchers and investors have released information that is relevant, accessible, attractive, credible and comprehensible then disseminators will pick it up and carry the message around the globe. Disseminators included businesses such as news agencies, media networks, press, television and radio networks and individuals and non-profit organizations as diverse as *Why Islam* and the *World Bank*.

Evaluators provide the necessary step of validation, presenting evidence of the effectiveness of a communication strategy and identifying area for improvement. The Global Carbon Project had no evaluators identified at the beginning of this study and did not have access to the web statistics that were tracked through their web hosting organisation, the CSIRO. Because of a new understanding the measuring methods used by WebTrends to generate web statistics, the redesign of the website changed the structure to include clearly defined addresses for supporting information relating to particular media releases. By setting up alerts through the search engine *Google*, we were informed of a number of stories generated as soon as the information was made public. This is an area that needs further development and is an essential aspect of a formal communication strategy.

The agents of communication model is a simple sorting method to determine which actors have influenced the spread of information. A more in depth study of the investors and disseminators would be useful to determine where these agents have their greatest effect and how they can be supported. The costs associated with organising information and preparing press kits seems modest in relation to the coverage gained.

The internet is the meeting place where hosted information can be actively taken up and passed on through databases and private channels as well as through the world wide web. Any media such as posters and brochures that did not have a newsworthy aspect were disseminated to only a small number of people through display and distribution, attracting little interest even when available on the Global Carbon Project website. The greatest information spread happened when the findings were released through a highly respected peer reviewed journal; the message had bearing on current events; news

services were provided with press releases; and supporting information was made freely available on the world wide web.

The major difference in the intrinsic reach of these communication artefacts is their suitability for distribution over the World Wide Web. While personal interactions can be very powerful and long lasting, they do not have the same reach as the internet. The impact of poster displays, personal presentations and workshops are limited by the size and interests of the audience for a particular event. Brochures, reports and PowerPoint files have similar limitations unless they have an easily accessed presence through the internet.

Web sites and media releases have the potential to interact with a large number of agents who can further disseminate their messages. The web supports two way communications and allows the audience to tailor the information flow by searching the internet using keywords (Lodge, 2006). The increased use of Really Simple Syndication (RSS) feeds (where headlines, for example, can be sent directly to a home page and updated instantly) strengthens the flow of user selected conduits with little ongoing effort by either the author or the audience.

For these reasons, the update of the Global Carbon Project web site to be compliant with best practice has been a valuable investment. Interestingly, an attractive feature of the website, which has real value to the audience is that it provides current and credible information, including access to PowerPoint files presenting the graphic displays of data and high level analyses. In this way it is both an artefact and agent in the communication of carbon science.

Media releases are commonly used to present information that might be considered newsworthy in the hopes that journalists and media networks will act as agents in the dissemination of information. In the case of the Global Carbon Project, media releases were used sparingly, but had by far the greatest reach and effect. The effectiveness of the media releases was amplified by both the credibility of their sources and the assumed newsworthiness of their content.

At the beginning of my time with the Global Carbon Project I was given intensive instruction on the most recent scientific understanding of the carbon-climate-human systems. This included information from studies that were not yet published, awaiting acceptance from a highly regarded peer reviewed journal. In particular there was a synthesis analysis of the reduction of carbon sequestered in tropical forests, a slowdown of their absorption of CO₂ and the vulnerability of these sinks to both deforestation and feedbacks from the changing environmental conditions of a warming world.

As I realised that significant international policy decisions were being made without factoring in this new understanding I was surprised that it had not been made public. The scientists believed that if the findings were released prematurely they would not be accepted and promoted by the international media and that they were too important to let this happen. They thought it was better to wait, go through peer review, and ensure that the findings had credibility.

A year later the work was published in *Science*, under the title Tropical Forests and Climate Change, with media releases by all involved institutions and the journal. The publication coincided with a European meeting for a UNFCCC initiative to assess technical and scientific issues, and policy approaches and incentives, for reducing emissions from deforestation in developing countries. As I saw the stories immediately being carried by large media networks and developing a reach that exceeded even this, through inclusion in individual blogs on the web or viral networking, I began to understand why this strategy, when it finally came to fruition, was so successful. As soon as it was released, the information was immediately accepted because of the credibility of the source and then spread widely to suit the motives of a great range of people and institutions.

This observation highlighted a particular restriction on how scientific knowledge grows and how quickly it comes accepted and known. We can picture the peer reviewed journal as a doorway to new information, the eagerly awaited newest findings in many fields, in particular those relating to our understanding of swiftly changing aspects of the global environment. On one side of the doorway there are scientists, their

institutions, projects and findings. On the other side are the policy makers, colleagues and students who need the most current understanding to guide their decisions and serve as foundation and direction. The

As we look at the agents of communication this doorway becomes the residence for the most limiting factor in the mass communication of credible research findings. In some high impact journals, through sheer volume alone, 90% of all submitted articles are rejected (Nature, 2007).

Conclusion

The success of the GCP efforts relies on the actions of agents of dissemination who promoted the carbon science messages for their own purposes. The widest information dispersal was achieved through the use of press releases for results published in peer reviewed journals. This engaged wide, but short lived international media attention. The issue of authority in science communication was highlighted by the ready acceptance of messages delivered in the time honoured tradition of the peer reviewed journal. The further dissemination of information through media networks, news services and the social networks of informal web logs or blogs took the information away from the careful framing of the scientific study and brought it into the changing recollection of public awareness.

Science communication is accomplished through a range of agents who perform the research, invest in its effective release into public knowledge, disseminate the findings, both formally and informally and evaluate the resultant spread of information. While a variety of communication methods are essential for the dissemination of research findings to a science and policy based audience, the Global Carbon Project findings have been most widely spread through their inclusion in the internet dominated mass media. A science communicator in an organization such as the Global Carbon Project with a small budget and intermittent opportunity can have significant effect by supporting the agents who are invested in promoting the spread of information. This can be accomplished by timely press releases, providing instant access media resources through dedicated web pages, as well as supporting scientists through more traditional presentation methods of PowerPoint slides and posters.

A high level of credibility in the research findings and their publication in highly cited peer reviewed journals is a distinct asset in launching a program of information dissemination. Timing of media releases to coincide with high profile news and policy events may play an important role in the uptake of one release over another. In February 2008, an interim report to the Australian government from the Garnaut Climate Change Review (Garnaut Climate Change Review, 2008) cited artefact 10 of this study, the PNAS paper *Contributions to accelerating atmospheric CO₂ growth from economic activity, carbon intensity, and efficiency of natural sinks*, published only 4 months earlier. Seeing policy recommendations informed by the work of the Global Carbon Project is an affirmation of the effectiveness of their efforts to bring GEC research findings to the place where they are needed most.

Statistical analyses of web site activity can be a useful indicator of changes in traffic patterns but the base causes for the changes are not necessarily apparent. In the case of the highest peaks of monthly activity recorded for the Global Carbon Project website as seen in figure 32, it is important to remember that IPCC activities and other media attention to climate change science and policy are important multipliers for media attention. While it is not possible to separate all of the factors that influence the dissemination of information the application of the agents of communication model provides a starting point for analysis. In the end, engagement with the most effective agents of dissemination can lead to efficient and cost effective communication strategies, informed by the feedback from appropriate evaluators.

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Figures

<i>Figure 1.</i> Sample dissemination pattern.....	12
<i>Figure 2.</i> Earth System Science Partnership and Global Carbon Project relationship.....	18
<i>Figure 3.</i> UNESCO Scope Policy Brief No. 2. “The Global Carbon Cycle”	25
<i>Figure 4.</i> Dissemination pattern: UNESCO Scope Policy Brief No. 2.	29
<i>Figure 5.</i> Web visits to GCP download page for UNESCO Scope Policy Brief No. 2.	34
<i>Figure 6.</i> ESSP Conference Pack Brochure	36
<i>Figure 7.</i> Dissemination pattern: ESSP Conference Pack Brochure.....	38
<i>Figure 8.</i> ESSP Conference Poster.....	41
<i>Figure 9.</i> Dissemination pattern: ESSP Conference Poster.....	44
<i>Figure 10.</i> Emissions Growth Media Release on AlphaGalileo.....	47
<i>Figure 11.</i> Dissemination pattern: Emissions Growth Media Release	50
<i>Figure 12.</i> Global Carbon Project link to Science article press release	53
<i>Figure 13.</i> Dissemination pattern: Science Publication – Media Release	56
<i>Figure 14.</i> Web visits to GCP download page for Science Publication – Media Release	59
<i>Figure 15.</i> Technorati web posts as at 16 May 2007	60
<i>Figure 16.</i> Global Carbon Project link to Proceedings of the National Academy of Science May 2007 article press release	62
<i>Figure 17.</i> Dissemination pattern: Proceedings of the National Academy of Science May 2007 Publication – Media Release.....	65
<i>Figure 18.</i> GCP download page visits for Proceedings of the National Academy of Science May 2007 Publication – Media Release.....	69
<i>Figure 19.</i> WebTrends data for www.globalcarbonproject.org visits by day for May 2007.	70
<i>Figure 20.</i> New web design – home page.....	72

<i>Figure 21. Original web design – home page</i>	73
<i>Figure 22. Dissemination pattern: Global Carbon Project web site redesign</i>	77
<i>Figure 23. WebTrends report Global Carbon Project website unique visitors</i>	80
<i>Figure 24. Cover, Carbon Offsets and Reductions report</i>	82
<i>Figure 25. Global Carbon Project link to Carbon Offsets and Reductions</i>	83
<i>Figure 26. Dissemination pattern: Carbon Reduction and Offset Report</i>	87
<i>Figure 27. First and final slides in Carbon Offsets Presentation</i>	90
<i>Figure 28. Dissemination pattern: Carbon Offset Workshop Presentation – Barcelona</i>	93
<i>Figure 29. Global Carbon Project link to Proceedings of the National Academy of Science</i> October 2007 article press release	96
<i>Figure 30. Dissemination pattern: Proceedings of the National Academy of Science October</i> 2007 Publication – Media Release	99
<i>Figure 31. AlphaGalileo press notices: Proceedings of the National Academy of Science October</i> 2007 Publication – Media Release.....	101
<i>Figure 32. Global Carbon Project web site peak activity per month</i>	102

Tables

Table 1. Acronyms	5
Table 2. Communication Artefacts	23
Table 3. Distribution of printed UNESCO Scope Policy Brief No. 2.	32
Table 4. <i>AlphaGalileo press notices: Science Publication – Media Release</i>	58
Table 5. <i>AlphaGalileo press notices: Proceedings of the National Academy of Science May 2007</i> <i>Publication – Media Release</i>	67
Table 6. Artefacts and agents summary.....	103